MANUAL
To Accompany
MATHEMATICS
For Everyday Use

BOOK TWO

QA
39
B21
bk.2
man.

CURR HIST

Ex libris
universitatis
albertaensis

85

Claudia A. Parker
11214 - 97 St.
Edmonton.

PROVINCIAL ARCHIVES
OF ALBERTA
ACC. 73.110

Digitized by the Internet Archive
in 2016

https://archive.org/details/mathematicsforev02bant_0

MANUAL

TO ACCOMPANY

MATHEMATICS for EVERYDAY USE

BOOK TWO

THE JOHN C. WINSTON CO., LIMITED
TORONTO

Copyright, Canada, 1936, by
THE JOHN C. WINSTON CO., Ltd.

All rights reserved

LIBRARY
UNIVERSITY OF ALBERTA

INTRODUCTION

The introduction to the MANUAL TO ACCOMPANY MATHEMATICS FOR EVERYDAY USE, Book One, outlines a modern interpretation of the newer thought about the teaching of elementary mathematics on the Grade VII level. This introduction will present for your consideration some important features that have not received sufficient emphasis in our conventional treatment of the teaching of mathematics.

Teaching is the directing of learning. The pupil must sample certain well-chosen experiences of life. It is not the amount of experience that educates, but the amount of carefully organized experience.

Mathematics is considered a skill subject. "A skill is a well organized and well co-ordinated way of acting." Skills function only in situations recognized as being similar to those in which training occurred. In the following pages, techniques will be devised to assist the pupil in applying "tools" once mastered.

Techniques are but superficial aspects of teaching. The really important thing is the interest of the pupil. Motivation is the key to successful teaching. "To motivate means to intensify and to direct activity." The pupil must have a goal and he must value that goal. Goals need not be remote, but should be looked upon as milestones to be reached, only to find other milestones ahead. Directed growth is the keynote of modern education. The end of education is the production of

2760482

a thinking boy or girl. In the following pages particular attention will be paid to direct and indirect methods of motivation, with special stress laid on self-competition as one of the most wholesome forms of motivation.

We are not at all certain that repetition of nerve connections explains learning. There is much evidence to indicate that learning and retentiveness are functions of the total mass of brain tissue. The teacher's problem is that of following understandingly and directing the mental processes of the pupils as they work. The teacher must be able to identify the separate elements, to devise economical ways of teaching them to the pupils, and to arrange the elements in such a way that each receives an adequate amount of practice. Repetition may not be the immediate condition for learning, but in the absence of better information we had better stick to repetition; but, as far as possible, drill should be given in its natural setting.

Supervised study is a phase of economical learning. Greater emphasis should be placed on teaching our pupils how to study. The following supplementary rules are listed by the University of Wisconsin, Department of Education, under the head, "How to Study."

1. Put together what you wish to have together. Keep apart what you wish to have separate.
2. Study with a strong determination to remember.
3. Clear comprehension is necessary to permanent retention.
4. Put things together energetically. Concentrate attention upon your work. Close attention is better than repetition.
5. Learn to use the methods of recall in your study.

6. Make associations purposely. Do not leave them to chance.
7. Organize. Knowledge should be a well-ordered group of connections related to one another in useful ways.
8. Learn to work rapidly. While too much speed may become confusing, too little activity invites mind wandering.
9. Insist upon mastery. Things half learned are soon forgotten.
10. Plan for systematic reviews. Do not neglect them.
11. Review selectively.
12. Plan a way to make use of what you have learned as soon as possible.

As in Book One, subject matter is integrated under the caption of unified mathematics. The outstanding features of Book One are retained in Book Two. Goals are set according to the learner's level of maturity. Enrichment exercises take care of individual differences in learning capacity. Simplicity, as an aid to understanding, is pedagogically sound in the illustrative material. Diagnostic and remedial teaching is continued, placing an obligation on the teacher to analyze the pupil's performance and to discover its strong and its weak features. The teacher must be quite concerned with the individual pupil. Remedial work is undertaken in the light of the findings of the diagnosis.

Much of our treatment of errors is unsuccessful because it is based on too little understanding of the psychological nature of the error and the process leading up to it. Teachers must be able first to distinguish between temporary lapse and thorough-going disability. Teachers

are urged to study the various skills in the fundamentals with integers and fractions listed in the Manual that accompanies Book One. Corrective work will be treated in some detail in this Manual.

A recent study of errors made by a ninth-grade algebra class, reveals the weaknesses of our elementary-grade teaching when measured in terms of the success which pupils show in carrying over arithmetic to the study of higher mathematics. Of a total of 407 errors, 344, or 84.5%, were errors in simple arithmetic, signs, copying, or reading, in using incorrect operations, and errors due to a lack of comprehension of words. Greater attention to the individual pupil and a careful analysis of his performance, to be followed by carefully chosen corrective work, will remedy the above situation to a considerable degree. Such work requires the keeping of an accurate case-record of each pupil, and constant reference to this record.

There is much to be done before we shall have solved the difficulties that seem to exist in applying the fundamental processes in the solution of problems. Much of our difficulty is found in the illustrative material used by teachers being too difficult for the pupil. Teachers are urged to keep such work as simple as possible, with proper consideration for the mental level of the pupil; the work that follows should tax his mental capacities and insure that he is working up to capacity. In the following pages, techniques will be suggested for aiding the pupil to visualize the problem.

This Manual emphasizes the value of the everyday contacts of the individuals with their environment. Teachers are urged to instil into their pupils the exploratory attitude, to become problem-seekers and problem-solvers.

SECTION I

Page 1.

Preliminary to this work, devote some attention to time, as related to the arrival and departure of trains.

A.M., *ante meridiem*, meaning "before noon."

P.M., *post meridiem*, meaning "after noon."

A few years ago, railway time-tables listed arrivals and departures on the principle of twenty-four hours to the day. 1 P.M. was 13 o'clock; 6:15 P.M. was 18:15 o'clock; 11:30 P.M. was 23:30 o'clock. The average traveller was confused because there was no numerical connection between watch time and train time. Today, watch time is train time, and the distinction between forenoon and afternoon is made by using the abbreviations A.M. and P.M. and by placing the A.M. times in light type and the P.M. times in heavy type.

Page 3.

This survey test on the fundamentals will give a general picture of the status of the class. The norms are carefully standardized and will enable you to determine the relative status of the pupils in the class as compared with pupils of a similar grade in general. If these results are graphed in some simple manner, the students will be impressed when shown the comparison of the average school score with the standard score.

Page 4.

A progress chart for each pupil is absolutely essential if you, the teacher, are going to be quite concerned with

the progress of the individual pupil. Self-competition is the most wholesome form of motivation. The child must be made aware of his progress at all times.

Page 5.

The histogram (column diagram) is one method for plotting a frequency surface. A frequency table shows frequencies with which scores occur in different groups. The histogram appears to show gaps or breaks. Such gaps occur because sufficiently fine measuring instruments have not been used. Sometimes a histogram is smoothed out into a frequency polygon to avoid gaps and jumps. At the bottom of page 6, join the middle points of each horizontal line in the histogram, Problem 9, and you will have constructed a frequency polygon. The generalized theoretical curve is a bell-shaped curve.

Page 6. *Exercise 4.*

The average score is found by dividing the sum of the scores by the number of pupils. A satisfactory scheme is as follows:

	Score	Frequency	Score × Frequency
12. ////	12	4	48
11. ///	11	3	33
10. //	10	2	20
9. ////	9	4	36
8. ////	8	4	32
7. ///	7	3	21
6. ////	6	4	24
5. ///	5	3	15
4. /	4	1	4
	Totals.....	28	233

Average score: $\frac{233}{28} = 8.32$.

AN EXERCISE IN PROBLEM SOLVING

To the pupil: You will find that answering the following five questions about every problem you are asked to solve will increase your ability to solve problems correctly. Answer questions I–V for the problems below.

I. What does the problem ask for? Be sure that you understand every word in the problem.

II. What would be a reasonable answer? Make an estimate before you try to work the problem. This will prevent many unreasonable answers.

III. What must you do to solve the problem? Decide what computations are necessary to solve the problem. Sometimes there is more than one step in the work.

IV. Is your answer a reasonable one? Check your answer with the estimate you made after you have done the work required.

V. How did you check your work? Remember that nearly one-third of the mistakes in problem solving are due to errors in computation.

1. In one year Helen's weight increased from $76\frac{1}{2}$ pounds to $82\frac{3}{4}$ pounds. What was her average monthly increase in weight?

2. On a 150-mile automobile trip Mr. Smith used $7\frac{1}{2}$ gallons of gasoline. What was the average cost a mile for gasoline at 20 cents a gallon?

3. What is the volume of a tank whose dimensions are 4 feet by 6 feet by $3\frac{1}{2}$ feet?

4. Find the discount on a \$20 bicycle bought at a 20%-off sale.

5. Henry paid \$30 for a bicycle at a 25%-off sale. What was the list price of the bicycle?

6. How long a ribbon will be needed for 20 bows, allowing 2 feet 6 inches of ribbon for each bow?

7. How much will it cost to cover the floor of a kitchen 12 feet long and 10 feet 6 inches wide at 15 cents a square foot?

8. Alice weighs 84 pounds. The normal weight for her age is 80 pounds. Her weight is what per cent of normal?

9. What is the interest on $750 for 4 years 6 months at 6% a year?

10. Mr. Smith bought 25 pounds of paper at 12 cents a pound. He was allowed a discount of 2 per cent for cash. What did he pay for the paper?

Page 7.

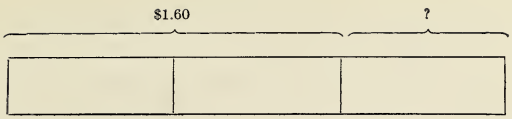
These practice tests are slightly more difficult than those on page 3. Find the average score made by your pupils in each set of examples on page 3 and compare it with the average score on each set of examples on page 7.

Pages 8 and 9.

Note that the exercises on page 9 are remedial in type and are to be done only by the pupils who have had difficulty with type examples on page 8. In Exercise 3, any mistake would be likely to be caused by the pupils' failure to convert $\frac{1}{2}$ to $\frac{2}{4}$ correctly. Give practice on the exercises under 2 and 5, page 9.

Pages 10 and 11.

Get the habit of making a diagram to help the pupils to see the relations. Problem 7, page 11. Draw a figure to represent the regular price and divide it into three equal parts:



Then "$\frac{1}{3}$ off" will leave two of these parts to represent the $1.60. "$\frac{1}{3}$ off" is $\frac{1}{2}$ of $1.60, or $.80. Add this to the $1.60 and you find the regular price, or $2.40.

Attempt to get the pupils to see that if 2 parts represent $1.60, 3 parts represent $\frac{3}{2} \times \$1.60 = \$2.40$. Treat the other problems on these pages in a similar manner.

Page 12.

Many teachers prefer to work such examples in addition in the equation (horizontal) form, as: $\frac{1}{2} + \frac{1}{6} + \frac{1}{2} = \frac{3 + 1 + 3}{6} = \frac{7}{6} = 1\frac{1}{6}$. The only objection is that this form is found only in the schoolroom, and seldom, if ever, in actual life. In these exercises, use the method with which you are familiar. Many teachers believe that exercises such as these should be done mentally, the pencil being used only to write the answers.

Page 13.

This page introduces an important topic in an elementary manner. Every boy (or girl) who works at any time, should be urged to keep an account of his earnings either in hours or in dollars and cents:

1. It is good business practice.
2. He is able to check the amount in his pay envelope.
3. It gives him a feeling of independence and confidence.
4. He is able to estimate his earning power and budget his earnings accordingly.

5. An employer will welcome such a sign of business acumen.

Discuss with the pupils, summer, as well as part time employment. Make a list of such occupations, as:

1. Caring for gardens.
2. Caring for lawns.
3. Delivering for stores.
4. Taking care of children.
5. Selling magazines, newspapers, Christmas cards, etc.
6. Running errands.
7. Doing chores, such as bringing in wood or coal, shovelling snow from walks, caring for lawns, gardens, and boulevards.

Establish a fair wage, or scale of prices, for each occupation listed.

Appoint a committee to make contacts with business men and householders to secure part-time employment for those in need of same in the class.

Page 14.

Pupils are urged to do these exercises mentally, using the pencil only to record the answers. In these exercises use the method with which the pupil is familiar. Before reaching Grade VIII, pupils have had several different teachers. There are several methods taught for subtracting. Each teacher enforces her method, irrespective of the method already known by the pupils. Take the last exercise on the page,

$$\begin{array}{r} 12\frac{2}{5} \\ -11\frac{3}{4} \\ \hline \end{array} \qquad \begin{array}{r} 11\frac{7}{5} \\ -11\frac{3}{4} \\ \hline \end{array} \qquad \begin{array}{r} 11\frac{28}{20} \\ -11\frac{15}{20} \\ \hline \frac{13}{20} \end{array} \quad \text{or}$$

$$12\tfrac{2}{5} - 11\tfrac{3}{4} = 11\tfrac{7}{5} - 11\tfrac{3}{4} = \frac{28 - 15}{20} = \tfrac{13}{20}$$

In either cases the child can think either in terms of subtraction or of addition. $12\frac{2}{5} + \frac{1}{4} = \quad 12\frac{13}{20}$

$$-11\frac{3}{4} + \frac{1}{4} = \underline{-12}$$

$$\frac{13}{20}$$

This is the method of equal addition where we add a fraction to the subtrahend that will make the sum of the two fractions 1, which added to 11 gives 12. We add the same fraction to the minuend. Then subtract the whole number from the mixed number.

The introduction of addition and subtraction of decimals, also decimal and fractional equivalents in earlier grades should eliminate much of this type of work. The above question should be done: 12.40

$$\underline{-11.75}$$

See how many of the examples on this page can be simplified by using decimal equivalents.

Pages 15 and 16.

Before doing the work on these pages, it is wise to review the comparison idea of fractions. A fraction is a ratio or a comparison number which tells how one whole compares to another. The relation of one number to another may be a whole number, a fraction, a decimal, or a mixed number. The quotient is always the relation (ratio) of the dividend to the divisor.

Exercise 3.

Think of the relation of 1 pound of fudge (*a*) to 3 pounds; (*b*) to $\frac{1}{2}$ pound of fudge. Each measurement in the recipes for the given quantities must maintain this relationship.

a. 3 pounds are 3×1 pound. Therefore we have 3×2 cups of sugar, $3 \times \frac{1}{4}$ cup of water, $3 \times \frac{3}{4}$ cup of milk, etc.

b. $\frac{1}{2}$ pound is $\frac{1}{2}$ of 1 pound. Therefore we have $\frac{1}{2}$ of 2 cups of sugar, $\frac{1}{2}$ of $\frac{1}{4}$ cup of water, $\frac{1}{2}$ of $\frac{3}{4}$ cup of milk, etc.

Page 17.

It is a common practice in exercises such as these to change the mixed numbers to improper fractions before cancelling and multiplying. Many of these exercises should be done mentally. An exercise such as $9\frac{2}{3} \times 8$ should be broken up as

$$9 \times 8 + \tfrac{2}{3} \times 8 = 72 + \tfrac{16}{3} = 77\tfrac{1}{3}$$

Page 18.

In Exercise 9, a common mistake made by children is to write this amount as .86 cents. Always correct such an error.

Page 19.

Many practices that confuse children are used by teachers. Experience has shown that in any division involving mixed numbers, they should always be reduced to improper fractions first.

Page 23.

Enrichment Exercises.

According to Section 7 of the British North America Act, a general census of the population of Canada was to be taken every tenth year, commencing 1871. With the setting up of the provinces of Alberta and Saskatchewan, it was estimated that there would be a rapid influx of settlers; hence Section 18 of the two Dominion Acts of 1905 proclaimed a census in these provinces in every

fifth year, commencing 1901. The census of 1936 is being taken in Alberta, Saskatchewan, and Manitoba. The Imperial Act of 1907 amending the B.N.A. Act, Section 1, proclaims the following grants yearly by Canada to every Province:

1. A fixed grant.

When the population is between 4 and 8 hundred thousand, the sum of 190 thousand dollars.

When the population is between 8 and 15 hundred thousand, the sum of 220 thousand dollars.

2. A grant, in lieu of customs, at the rate of 80 cents per head of the population.

a. Has the growth of western Canada since 1906 justified the quinquennial census?

b. Obtain the results of the 1936 census and calculate the grant payable to each province.

In 1930 the provinces received their natural resources and the payment of some of these subsidies stopped.

The following table gives the population of each province together with its elected members and senators:

Province	Population	Elected Members	Senators
Prince Edward Island	88,038	4	4
Nova Scotia	512,846	12	10
New Brunswick	408,219	10	10
Quebec	2,874,255	65	24
Ontario	3,341,683	82	24
Manitoba	700,139	17	6
Saskatchewan	921,785	21	6
Alberta	731,605	17	6
British Columbia	694,263	16	6
Yukon	4,230	1	0

a. Compare the population of the three maritime provinces with that of the four western provinces and note the number of senators for each section.

b. The salary of each senator is $4,000 per annum, less 5% salary deduction. Calculate the total salary paid to members of the senate of Canada.

Page 24.

1. The new Welland Canal was formally opened August 6, 1932.

2. The locks of the new canal are 820 ft. long, 80 ft. wide and 30 ft. in depth. In the old canal, they were 270 ft. long, 45 ft. wide, and 14 ft. deep. Compare the cubic content of these locks.

(*Ans.* 1,968,000 cu. ft.; 170,100 cu. ft.)

3. There were 25 locks in the old canal. It took on an average $16\frac{1}{2}$ hours to pass through. Calculate the saving in time. (*Ans.* $8\frac{1}{2}$ hr.)

4. Trace the course of each canal on a map.

5. From Fort William to Kingston is approximately 1,200 miles. The St. Lawrence Treaty calls for a deepened St. Lawrence waterway. Discuss the effect on Canadian trade of sea-going vessels entering the trade routes of the great inland lakes of North America.

6. Compare the cost of the Panama Canal (£75,000,000) and the Suez Canal (£29,725,000) with the cost of the Welland Canal. (£1 = $\$4.86\frac{2}{3}$).

(*Ans.* $356,000,000 ($260,000,000 less); $144,661,666.67 ($9,661,666.67 less))

7. The Suez Canal is $87\frac{1}{2}$ geographical miles in length. If a grographical mile is practically the same length as a nautical mile, find the length in common miles. (1 knot = 1.151 common miles). (*Ans.* 100.7 miles)

8. In the Suez Canal, the rate of travel is limited to $5\frac{1}{2}$ miles per hour. How long does it take a ship to pass through the canal? (*Ans.* 18.3 hr.)

9. The toll charge for a large vessel is £3,000 each. An average of 17 boats per day make the trip. Calculate the average amount of toll received per day in dollars and cents. (*Ans.* $248,200)

10. Learn what you can about the Stalin White Sea-Baltic canal. This canal has 19 locks which lift a vessel 230 ft. The canal is 140 miles long.

Page 28.

It is wise to review the meaning of per cent; another name for hundredths. The meaning of "per cent of" should be linked with the already learned concepts of $\frac{1}{2}$ of, $\frac{1}{4}$ of, $\frac{3}{4}$ of, etc., as meaning per cent times or hundredth times. 5% of means 5% times or .05 $\times$.

Page 30.

In milk testing 4 per cent, there are 4 lb. of fat in 100 lb. of milk; in milk testing 3 per cent fat, there are only 3 lb. of fat in 100 lb. of milk. Fat exists in globules held in suspension. Cream is that portion of milk, rich in fat, which rises to the surface of milk on standing or is separated from it by centrifugal force. Cream may test as low as 15% of fat or as high as 50%. For buttermaking, cream should be skimmed of such richness (about 30%) that one gallon (10 lb.) of it will yield 3 to $3\frac{1}{2}$ lb. of butter. Salt adds weight to butter, from $\frac{1}{2}$ to 1 oz. being used for each pound.

Page 31.

It should be emphasized that there are three tools with which we can do the same work, the fraction, the decimal,

and the per cent. Usually it is necessary, before working problems, to change the per cent to a decimal or fraction. Too much time is often given to changing per cents to fractions. This practice should be limited to those per cents that are easily reducible. In changing fractions to decimals, it is wise that the division be carried out only two places. Where fractions are uneven in the second decimal place, it is customary to affix the remainder as a fraction, e.g., $\frac{1}{3} = .33\frac{1}{3}$. Give much practice in changing per cents to their most usable form.

$$34\% \text{ of } = .34\times$$
$$7\% \text{ of } = .07\times$$
$$135\% \text{ of } = 1.35\times$$
$$25\% \text{ of } = \tfrac{1}{4}\times$$
$$33\tfrac{1}{3}\% \text{ of } = \tfrac{1}{3}\times$$
$$100\% \text{ of } = 1\times$$

To find what per cent one number is of another (Second Case), find how many "hundredths" the first number is of the second. In the Third Case, use the traditional "one per cent method."

30 is 5% of .....?
6 is 1% of .....?
100 × 6 equals 600.

Page 33.

When working with per cents, always use the decimal equivalent unless the fraction equivalent is obviously more usable.

Enrichment Exercises.

1. Collect advertisements of sales in which a discount is offered.
2. List reasons why merchants give discounts.
3. Make and solve original problems.

Page 36.

Lead the pupils to see that the real problem is to buy and sell to make a reasonable profit. Sometimes no profit is made; goods may be stocked as a convenience to customers (stamps, etc.). Articles are often disposed of at a loss for various reasons. Perishable goods must be disposed of. State some other reasons why articles are sold at a loss.

Page 37.

For supplementary material on this page, see MANUAL TO ACCOMPANY MATHEMATICS FOR EVERYDAY USE, Book One, pages 71 and 72.

Page 38.

In marketing his crop, a farmer may stabilize the price of his wheat by "hedging" on the Winnipeg Grain Exchange. Certain delivery months are established as May, July, October, November, December. On July 31st, the price of wheat futures is $1.00 a bushel. A farmer wishes to stabilize his crop at this price.

July 31st he sells 5,000 bu. wheat futures at $1.00 for delivery in October.

October 31st he sells his crop at the market price of $.75.

There is an apparent loss on his crop sale, but he is able to buy wheat futures at $.75 and thus make delivery on his sale of July 31st. The gain of $.25 per bushel on his future trading has stabilized his price at $1.00 per bushel. In like manner the price was still stabilized at $1.00 had wheat advanced on Oct. 31st to $1.25 a bushel.

NOTE.—Of course he loses a small brokerage charge.

Page 39.

People who earn commissions act only as agents for owners of the products.

1. Have the pupils list those likely to be selling on commission.

2. List those that might receive both salary and commission.

3. Discuss the likelihood of farmers, carpenters, teachers working on a commission basis.

4. If possible, have children find rates of commission charged by various commission agents.

5. Study buying commission as well as selling commission.

NOTE.—See MANUAL TO ACCOMPANY MATHEMATICS FOR EVERYDAY USE, Book One, pages 78 and 79.

Page 40.

Attention is directed to the system of cross-references from diagnostic tests to appropriate remedial exercises. Note example 9. In the parentheses is found a cross-reference. If errors are made in the example, the pupil should turn to page 12 for additional practice with examples involving the same step of difficulty, as is found in the test. This provision makes possible a complete individualization of practice work.

Page 42.

Problem scales are really power tests. They are designed to discover the level of a student's progress in the subject.

Scales differ from the rate tests in two respects: (1) the time limits for the tests are so liberal that each pupil is given practically as much time as he needs to complete all the problems on the test; (2) the examples in the scale are arranged in the order of difficulty from very easy types, on which few pupils fail, to those which only a few pupils can work correctly. The difficulty has

been determined by the proportion of pupils who can work the examples correctly. In theory, a score on a scale indicates the level of difficulty at which a pupil is able to work a problem correctly. The problem scale is also a check on the level of difficulty of the regular problems being given to the pupils to be solved.

Problem scales are repeated on pages 80, 140, 214, and 253. These scales make possible repeated measurement at intervals during the year. In order to make your record cumulative, use the following gradings:

Excellent.....	9 to 10 correct
Good.....	7 or 8 correct
Fair.....	5 or 6 correct
Unsatisfactory	0 to 4 correct

PROJECT. *The Mathematics of Food.*

Food value is often measured by the amount of heat an article of food can produce. The unit of the heat-producing power of food is the calorie. Growing children and people who do hard physical work require more calories than those persons who do not take a great deal of exercise.

	CALORIES
First year.....	40–45
Second year.....	40–43
Third year.....	37–40
Fourth year.....	37–40
Fifth year.....	35–37
Sixth year.....	34–35
Seventh year.....	32–34
Eighth year.....	30–35
Ninth year.....	30–35
Tenth year.....	28–32
Eleventh year.....	28–32
Twelfth year.....	28–32
Thirteenth year...	25–30
Fourteenth year...	20–25
Fifteenth year.....	20–25
Sixteenth year....	20–25
Seventeenth year..	18

1. **Food requirements at different ages.** The number of calories, or units of food value, required for each pound of body weight a day

during each year of the growing period is estimated by one authority to be as shown in the table.

How many calories does a seven-year-old child weighing 58 pounds need? How many do you need?

A girl calculated that her food for one day contained 1,680 calories. She was 14 years of age and weighed 72 pounds. Did her food contain the required number of calories?

	Calories
Sleeping	0.4
Sitting quietly	0.6
Light muscular exercise	1.0
Active muscular exercise	2.0
Severe muscular exercise	3.0

2. **The food requirements of adults** are estimated to be the number of calories (see table) an hour for each pound of the individual's weight.

Account for the difference in the amounts of food required under the conditions given in the table.

3. **Food values.** The foods which we eat have been divided into three groups. The names given to these groups are proteins, carbohydrates, and fats. Proteins build up the body and keep it in repair. Carbohydrates, rich in starch and sugar, are fuel foods. Fats are richer in fuel than either starches or sugars.

a. From the table on the opposite page select articles of food that contain a mixture of all of the food values.

b. Using the tables given, plan a day's meals which will furnish a 180-pound laborer his required calories. Allow 8 hours for work, 8 hours for sleep, and 8 hours for rest.

c. Which would supply the larger number of calories, a pound of oatmeal or 7 pounds of apples?

Table of Food Values

Food Materials	Fats, per cent	Carbohydrates, per cent	Proteins, per cent	Total Calories to a Pound
Dairy:				
Milk (1 pint)....	52	29	19	314
Butter.....	99	..	1	3,448
Eggs.....	64	..	36	595
Grain:				
Oatmeal.....	16	67	17	1,810
Whole wheat....	3	84	13	1,641
Fruit:				
Apples (fresh)...	5	92	3	214
Bananas.....	6	89	5	290
Oranges.....	2	91	7	169
Raisins.....	9	88	3	1,563
Meat:				
Beef(lean).....	10	..	90	652
Fish (salmon)...	55	..	45	680
Mutton.....	67	..	33	1,185
Pork (bacon)....	87	..	13	873
Nuts:				
Peanuts.....	63	18	19	1,877
Walnuts.....	82	7	11	1,788
Vegetables:				
String beans....	7	71	22	176
Cabbage.....	9	71	20	138
Carrots.....	5	85	10	159
Lettuce.....	14	61	25	72
Potatoes (baked)	1	88	11	304
Spinach.....	8	80	12	108
Tomatoes (canned).....	8	71	21	103

d. Compare the various food values listed in the table. Make a list of approximate equivalences.

4. Find the number of calories in this luncheon:
1 pint of milk
1 egg (10 eggs = 1 pound)
Bread and butter (200 calories)
1 banana (4 bananas = 1 pound)
(*Ans.* 646 calories)

5. A normal diet of 1,800 calories should contain 165 calories of proteins, 490 calories of fats and 1,145 calories of carbohydrates. What per cent of the total should each kind of food material be?
(*Ans.* Fat, $27\frac{2}{9}\%$; protein, $9\frac{1}{6}\%$; carbohydrates, $63\frac{1}{18}\%$)

CURRICULUM TEST I GRADE VIII

DIRECTIONS: You will be allowed 25 minutes to work the problems below. Work rapidly, but try to have every problem correct. Begin to work when your teacher says, "Start."

Number Correct	.....
Rating.....	.....

After your paper has been marked, find the number of problems you had correct. Then look up your rating at the bottom of the page. Your rating is the number printed just above the number of problems you had correct. Record your rating in the box and begin your PROGRESS CHART.

1. Which is most, $\frac{1}{2}$, .45, or .375?	**1. Answer**.....
2. Find the cost of a dozen apples at 3 for 5¢.	**2. Answer**.....
3. What is 1% of 365?	**3. Answer**.....
4. If $\frac{1}{4}$ pound of butter costs 14¢, how much does a pound cost?	**4. Answer**.....

5. How many sixths are there in $\frac{1}{3}$? **Answer**.....
6. What is the cost of 600 post cards at $1.20 a hundred? **Answer**.....
7. How much less than the whole is 35% of a number? **Answer**.....
8. What fraction of a yard is 20 inches? **Answer**.....
9. Find the total weight in pounds of a dozen cans of peaches, each weighing 1 pound 4 ounces. **Answer**.....
10. What is the product of .04 and .06? **Answer**.....
11. On an auto trip Harold traveled 29.6 miles the first hour, 32.7 miles the second, 34.1 miles the third, and 30.2 miles the fourth. What was the average number of miles he travels an hour? **Answer**.....
12. In taking a census the average size of a farm was found to be 148.2 acres. The average value of an acre was $81.50. What was the average value of a farm? **Answer**.....
13. A $25 suit of clothes was sold for $22.50. What was the per cent of reduction? **Answer**.....
14. Find the interest on $725 at 6% for 2 years 4 months. **Answer**.....

15. How much does a metal ceiling for a room 15 feet wide and 16 feet long cost at $7.20 a hundred square feet? **15. Answer**.....

16. In 1927 the average production of cotton was 159 pounds an acre. How much was received for this cotton at $10.60 a hundred pounds? **16. Answer**.....

17. A commission merchant sold 275 barrels of apples at $4.75 a barrel. His commission was 4%, freight was $76.49, and drayage, $4.75. What were the net proceeds? **17. Answer**.....

18. About 20% of the population of a city are children of school age. Find the approximate population of a city if the school population is 2,568. **18. Answer**.....

19. A line $\frac{1}{4}$ inch long represents 10 miles. Find the area of a rectangle 3 inches by $1\frac{1}{4}$ inches drawn to the same scale. **19. Answer**.....

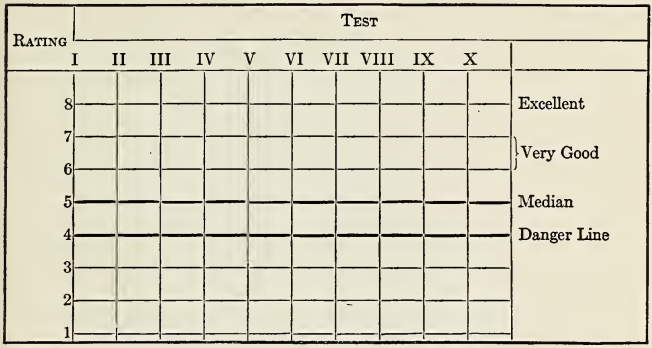
20. Write the interest formula. **20. Answer**.....

STANDARDS

Rating.....	1	2	3	4	5	6	7	8
Number Correct.....	0–3	4–6	7–8	9–11	12–13	14–16	17–19	20

PROGRESS CHART

Use this chart to graph your scores. Watch your progress. Your teacher will show you how to make your graph.



Note.—There are ten of these tests in the Manual. One is to be given each month during the school year.

SECTION II

Pages 43 and 44.

As enrichment material, have the pupils secure accurate local information; the cost of gasoline, oil, license, insurance, rent, etc., for different makes of cars. Turn to pages 96 and 97 and study automobile insurance. Do not forget interest charges on invested capital, or unpaid instalments.

The United States Bureau of Standards tests give the following tabulation of gasoline consumption at varying speeds.

10 miles per hour, 18.7 miles per gallon
20 miles per hour, 18.9 miles per gallon
30 miles per hour, 18 miles per gallon
40 miles per hour, 16.4 miles per gallon
50 miles per hour, 14.6 miles per gallon
60 miles per hour, 12.6 miles per gallon
70 miles per hour, 10.6 miles per gallon
80 miles per hour, 8.6 miles per gallon

The American gallon is used in each case.

a. Change these mileages to Canadian gallons.

b. Make problems, using the data given.

c. 6.9 times as much oil was consumed at 55 miles an hour than was used at 30 miles an hour. Discuss the topic of oil consumption at different speeds.

Page 45.

a. As enrichment material, ask the pupils to visit a grocery store and see how honey is sold. Note the types of containers and the labels that indicate grades. Ask

the prices of the various quantities offered. Note the names of the localities from which the honey came.

b. Have the pupils learn all they can about honey production. Bees are sold by the pound. Write the Superior Honey Co., Lethbridge, Alberta, for prices. Compile statistics as to the cost of a hive of bees and the likely returns from it.

c. Have the pupils study the habits of bees.

Honey may be used in home cooking as a substitute for sugar or molasses:

1. Measure honey always in liquid form.
2. For every cup of honey used, reduce the liquid called for in recipe by one fifth.
3. Use $\frac{1}{4}$ to $\frac{1}{2}$ teaspoon of soda to each cup of honey.
4. Increase the amount of salt by $\frac{1}{8}$ to $\frac{1}{4}$ teaspoon.
5. One cup of honey is as great in sweetening power as one cup of sugar. In cakes (except fruit cakes where all honey may be used), use half honey and half sugar.

a. Turn to pages 15 and 16 of the text and rewrite the recipes, substituting honey for sugar on the basis of the principles outlined here.

Page 46.

This type of consumers' co-operative is very limited in its scope. There are many difficulties, such as costs of ordering and distribution. Credit must be arranged. An interesting study is that of the growth of consumers' co-operatives in the world. In the village of Rochdale near Manchester, England, in 1842 there were twenty-eight flannel weavers. They were very poor and found the quality of the goods they purchased was very poor. They saved their pennies for more than a year and on

December 21, 1844, with their combined savings of $140, they opened their own store, becoming owners of it as well as buyers from it. At first, the store opened two evenings a week. After seven years it was open every day. They did not sell at wholesale prices, but they distributed the profits to the purchasers in proportion to their purchases. In the last five years, the English Co-operative Wholesale Society has given back more than 600 million dollars to its members.

a. Study the rise of the co-operative movement in England, Denmark, Japan, America, and Sweden.

b. There are seven forms of the co-operative movement:

1. The consumers' co-operative.
2. The producers' co-operative.
3. The international marketing co-operatives.
4. The credit union, a poor man's bank, a savings and loan association.
5. The utilities co-operative.
6. The insurance co-operatives; all forms of social insurance.
7. The mutual aid co-operatives; the consumers' and producers' co-operatives vote funds by common consent for the purposes of mutual aid, relief, and charity.

Study these seven forms as an interlocking and international system.

Page 48.

This topic is new to the teachers in Alberta so must be covered more in detail.

Instalment buying enters into so many selling and purchasing transactions today, that it is necessary for you to know some of the advantages and disadvantages

of this business procedure. Ask your teacher to discuss the topic with you. List the advantages and the disadvantages.

Mrs. Jones wishes to buy an electric refrigerator. She is quoted $225 cash, or $90 cash and 6 monthly payments of $25 each. What rate of interest did she pay if she bought on the instalment plan?

Solution:

Instalment price..... $6 \times \$25 + \$90 = \$240$
Cash price..... $= 225$
Difference in price..... $= 15$

She pays interest on \$25 for 1 month
\$25 for 2 months
\$25 for 3 months
\$25 for 4 months
\$25 for 5 months
\$25 for 6 months
\$25 for 21 months

\$15 is the interest on \$25 for 21 months.
\$8.57 is the interest for a year.
\$8.57 = 34% of \$25.

Many firms do not state the cash price in their advertisements. This prevents the purchaser from figuring the rate of interest when the purchase is considered.

Calculate the interest rate on each of the following sales:

Articles	Cash Price	Down Payment	No. of Payments	Payment Each Month	
Radio set.....	\$60	\$3	12	\$6	(*Ans.* $38\frac{6}{13}\%$)
Car.....	840	300	12	50	(*Ans.* $18\frac{6}{13}\%$)
Stove.....	62.50	10	6	10	(*Ans.* $42\frac{6}{7}\%$)
Bedroom suite....	243	20	10	25	(*Ans.* $23\frac{31}{55}\%$)

Page 50.

NOTE.—A much simpler way to calculate each interest payment is to find the first interest payment and then subtract the interest on \$50 for 1 month at 6%, e.g., $\frac{6}{100} \times \frac{1}{12} \times \$50 = \$.25$, from each previous interest payment. Sometimes arrangements are made to pay so much per annum on the principal plus interest arranged in quarterly or half-yearly payments.

PROJECT. *Is It Cheaper to Pay Rent than to Own Your Home?*

During the years 1930 and 1936 this question has been asked many times. Many things besides actual cash values must be taken into consideration.

1. Make a list of the advantages of owning your home.
2. Make a list of the advantages of renting a home.

Case 1.

An owner of a \$5,000 house and lot has an equity of 40% or \$2,000 in the property and a 6% mortgage of \$3,000. His neighbor who rents a house of the same value at \$480 a year has \$2,000 invested in Dominion of Canada bonds which yield him a return of $4\frac{1}{2}\%$ or \$90. If he applies his bond interest against his rent he has to pay \$390 in rent out of his salary.

The owner has to pay certain charges or else he will lose his property:

Interest at 6% on \$3,000 mortgage	\$180.00
Taxes	150.00
Insurance	10.00
Repairs and renewals	50.00
	\$390.00
Payment on mortgage, 5% of \$3,000	150.00
	\$540.00

The $150 payment on the mortgage represents investment of new capital and reduces interest charges in subsequent years.

The owner must also provide for depreciation on his house. This will amount to about 4% a year including the actual cost of repairs and renewals, of which only $50 is actually spent. The house alone is worth $4,500, so depreciation which must be met some day, amounts to $180 a year.

Cost of owning your home:

Fixed charges	$390.00
Additional investment of capital	150.00
Provision against depreciation in value	180.00
	$720.00

Case 2.

The owner has his home entirely paid for while the neighbor has $5,000 invested in Dominion of Canada bonds which yield 4½% interest.

Cost of owning your home:

Taxes	$150.00
Insurance	10.00
Repairs and renewals	50.00
	$210.00
Annual depreciation reserve	130.00
	$340.00

The one who leased his house at $480 a year would receive $225 in income from his bonds to apply on his rent, which would leave him $255 to obtain from other sources.

Discuss the above cases and when you have fully mastered the details, apply them to local conditions and particular cases.

Page 51.

Exercise 8.

"A mortgage on real estate is a conveyance of the property by the debtor to the creditor to secure the payment of a certain sum of money, with a 'proviso' that it shall become void upon the payment of the debt and accumulated interest." A chattel mortgage is a lien on personal property, goods, and chattels and bears the same "proviso" as a mortgage on real estate.

There are many forms of deeds such as a Deed of Gift, Tax Sale Deed, Trust Deed, Quit Claim Deed. "A Warranty Deed with full covenants is one that guarantees a perfect title and quiet enjoyment of property to the purchaser and his heirs and assigns after him."

a. Discuss a mortgage as a good form of investment.
b. What care must be taken to safeguard a mortgage?
c. Discuss first and second mortgages as to safety of investment.
d. Banks are not allowed by law to lend money on the security of a mortgage on land. Why?
e. Discuss the effects of depression on mortgages and other investments.
f. Explain the meaning of the following terms: Registration of mortgage, transfer of mortgage, discharge of mortgage, equity, and foreclosure.

Pages 52 and 53.

The Canadian climate is particularly adapted to the production of beef cattle. Feeders should be in good condition when purchased. They must be fed regularly and have access to good fresh water and salt. A little exercise is desirable. On good pasture, satisfactory gains

may be made more cheaply than in the stable. An average gain over a season's feeding is 300 pounds. "Tops" or best finished cattle are always in demand. A farmer should keep himself informed on market conditions. "Tops" should be sold on the first strong market, thus leaving more time for attention to the other cattle that are left.

1. For supplementary statistics, turn to page 47, MANUAL TO ACCOMPANY MATHEMATICS FOR EVERYDAY USE, Book One.

2. Ask the pupils to look up (in any good newspaper) the livestock prices on Canadian markets.

a. In cattle listings, note the gradings: Choice, Good, Medium, and Common and the prices listed for each. Compare the price of Feeder steers with choice Butcher steers.

b. In hog listings, note the gradings: Select Bacon, Bacon, Butchers, Heavies, Extra Heavies, Lights and Feeders, Sows, Rough, Stags.

c. In lamb listings, note the gradings: Good Handy Weights, Good Heavies, Common All Weights.

Page 54.

It must be remembered that all lumber is not sold by the board foot. Trim lumber, like baseboards, picture moulding, casings, etc., is sold by the linear foot.

Preparatory to the work on pages 227–230, the pupils should learn to distinguish different kinds of lumber, as: planks, beams, studding, shiplap, common, dressed, rough, tongued and grooved, joists, moulding, flooring, finish, and the dimensions usually used for each. Make a visit to a lumber yard if possible.

Page 56.

The average price quoted for gold in Canada during March, 1936, was \$35.11 an ounce. The "fixed price" in Washington was \$35.00 an ounce, thus establishing a new par of $15\frac{5}{32}$ grains for the United States dollar. The old "standard" price was \$20.67 an ounce.

Can you give the reason why people are taking so much old jewelry to dealers in old gold?

The Pioneer Mine in British Columbia has an average gold recovery value of \$27.32 per ton. How many ounces of gold are recovered from each ton of the ore? (Use \$20.67 an ounce.)

In 1933, Canada produced 2,949,309 ounces of gold. What was the value of the output at \$35.11 an ounce? at \$20.67 an ounce? (*Ans.* \$103,549,923; \$60,962,031)

Can you distinguish placer-gold mining from lode-mining?

Make a list of the expenses that would enter into the production of gold by lode-mining. Make a report to your class.

On a map of Canada, locate as many large gold mines as you can.

Make up a number of problems, using the information given, and any other information you are able to secure.

Exercise 4.

The American silver coin weighs 412.5 grains per dollar, nine tenths pure silver. How much pure silver is there in a silver dollar?

The Canadian production of silver in February, 1936, was 1,235,039 ounces. Silver sold at 44.68 cents per ounce in Canadian funds. Find the value of the month's output. (*Ans.* \$551,815.43)

Page 57.

In spite of the enormous resources of coal in Canada almost 50% of the consumption is imported. The coal areas are situated in the eastern and western provinces, while Ontario and Quebec are more easily and economically supplied from the nearer coal fields of Pennsylvania and Ohio.

a. Teach the meanings of the terms *anthracite*, *bituminous*, and *lignite* coal.

b. The coal produced in Nova Scotia, New Brunswick, British Columbia and Yukon, are all classed as bituminous, while Alberta produces bituminous, sub-bituminous, and lignite, and Saskatchewan and Manitoba produce lignite only. Discuss the position in the coal market of Canada in each of the three western provinces, and the bearing of the coal produced on this position.

c. Discuss the question of freight rates and how they determine the distribution of Canadian coal.

Page 58.

For statistics on wages and the cost of living in Canada, see the *Canada Year Book*, 1934–1935, pages 852–859.

Page 62.

The work on this page may be extended to keeping household and farm accounts. If on a farm, this should include recording egg and milk production, accounts of revenue and expenditure, and finally balancing up the business of the year, using the form shown on the following page.

Example:

Received		Paid Out	
Live stock sold	$	Farm and living expenses	$
Farm and products sold	$	Farm machinery	$
Borrowed from bank	$	Farm buildings	$
Dairy products sold	$	Repayment of loans	$
Total		Personal expenses	$
Profit or loss	$	Total	

Pages 63 and 64.

In arithmetic, we recognize that the status of the pupil must be frequently surveyed to note group deficiencies; that diagnostic tests must be given at frequent intervals to locate specific difficulties in each process presented; that provision for remedial exercises must be made to furnish adequate practice materials in those steps of the process being taught that require additional attention.

CURRICULUM TEST II Grade VIII

Directions: You will be allowed 25 minutes to work the problems below. Work rapidly, but try to have every problem correct. Begin to work when your teacher says, "Start."

Number Correct	.....
Rating	.....

Find your rating and continue your Progress Chart.

1. At 3 for 10¢, how many things can you buy for 50¢? **1. Answer**.....
2. Which is least, $\frac{3}{4}$, $\frac{2}{5}$, or $\frac{3}{10}$? **2. Answer**.....
3. What fraction of a bushel is a peck? **3. Answer**.....
4. Write the formula for the area of a rectangle. **4. Answer**.....

5. How many sides has a parallelogram? **5. Answer**.....

6. What is the yearly interest on \$100 at $3\frac{1}{2}\%$? **6. Answer**.....

7. Find the cost of 20 letters at \$2.00 a hundred. **7. Answer**.....

8. A man receives \$5.40 for 9 hour's work. How much should he receive for 12 hour's work at the same rate? **8. Answer**.....

9. A certain number less 5 equals 9. What is the number? **9. Answer**.....

10. What is the area of a 7-inch square? **10. Answer**.....

11. Find the net proceeds of a \$700 sale, if the rate of commission is $3\frac{1}{2}\%$. **11. Answer**.....

12. What is the radius of a 7.5 inch circle? **12. Answer**.....

13. Allowing $1\frac{1}{4}$ cubic feet to a bushel, how many bushels of potatoes can be stored in a bin 8 feet by 6 feet by 10 feet? **13. Answer**.....

14. Find the cost of laying a concrete floor in a room 15 feet by 12 feet at \$2.50 a square yard. **14. Answer**.....

15. What is the area of a triangle, base 4.5 inches and altitude 6.2 inches? **15. Answer**.....

16. A merchant marked hats to sell at $3.00. They cost him $2.15 each. He estimated the expenses of his business at 18% of his sales. What was the net profit on each hat that he sold? **16. Answer**.....

17. A school building cast a shadow 56 feet long. At the same time a 12-foot stick held vertically cast a shadow of 16 feet. What was the height of the school? **17. Answer**.....

18. Find the radius of a circle whose circumference is 44 feet. **18. Answer**.....

19. A merchant sold shoes at a sale for $7.50. If the reduction was 25%, what was the regular price? **19. Answer**.....

20. How many revolutions a mile are made by the wheel of a bicycle 2 feet 4 inches in diameter? Use $\pi = 3\frac{1}{7}$. **20. Answer**.....

STANDARDS

Rating.....	1	2	3	4	5	6	7	8
Number Correct.....	0–3	4–6	7–9	10–11	12–14	15–16	17–18	19–20

SECTION III

Graphs.

From very early times, people have had some way of representing their ideas. The early Egyptians left records of their history in picture writing.

Today we have a system of printing and writing to represent our ideas. We have other ways of representing ideas, also, which may be read more quickly even than the printed or written page. One of these ways of representing ideas is called the *graph*. The word *graph* comes from the Greek, meaning "to write."

Page 66.

A pictogram such as the one representing the wheat yield an acre of five countries, would be quite confusing were it not for the line graph contained in it. The pictures of the baskets merely help to attract attention. If the lines were missing, a very faulty idea of the amounts of wheat produced by these countries would result. Considerable practice should be given in the choice of scales. 1 inch should represent 1, 10, 100, etc., or 5, 50, etc.; but should never be used to represent 3 or 7 or their multiples. Use plain paper at first, centering attention on the scale and the necessity for accurate ruler measurements. When squared paper is introduced, the student sees a way to save time and trouble and is not confused by it. Such a pictogram is called a *volume* or *block* pictogram. An area pictogram presents facts by means of areas. A bar graph is a form of area pictogram. The first lesson should consist in interpreting a given graph.

1. Try to find and present to the class an advertisement or graph illustrating the misuse of the pictogram.

Page 67.

Graphs are mathematical pictures and are used very frequently in newspapers, magazines, textbooks, and reference books. All persons should learn to read graphs quickly and easily. Bring such graphs to school for class study.

The comparisons made with this form of the broken-line graph is between two sets of data. Comparisons between several sets of data are indicated on page 68 of the text.

Page 69.

The curved-line graph often replaces the broken-line graph when we wish to show gradual changes. When a smooth curve results, it is preferable to a broken-line graph. To get a smooth curve, there must be an adequate number of points.

a. Make a curved-line graph based on a record of (1) daily temperatures at 4-hour intervals, at 3-hour intervals; (2) a patient's temperature chart.

b. To assist in the study of life insurance, make a curved-line graph of the age and expectancy of life.

Page 71.

The construction of a circle graph depends on a knowledge of angles and the use of the protractor. Review angles and their measurement. Review the finding of what percentage one number is of another.

The circle graph is used to show the relations of parts to wholes and to one another. It is used extensively by municipalities to indicate the collection and distribution of taxes. It provides a good review of percentage.

Page 73.

The bar graph is generally used when very large numbers are compared by ratio (a graph is a picture of a ratio). In such cases, the bar graph is not accurate but only approximate in its comparisons.

NOTE.—It is essential when dealing with children, that all bar graphs should start from zero; otherwise the picture of the ratio is distorted for them and does not leave a correct impression on their minds.

Rules for making bar graphs:

1. Draw the bars to scale when the numbers to be represented are large. Indicate the scale used.
2. Make all bars the same width.
3. Make all bars equally far apart.
4. Below the graph, state what the graph represents and label each bar.

The production of various grains in Canada during a recent year was as follows:

Corn	5 million bushels
Wheat	343 million bushels
Oats	366 million bushels
Rye	14 million bushels
Barley	102 million bushels

Make a bar graph according to the instructions listed above.

Pages 75 and 76.

Study the livestock reports in the daily paper, especially the Saturday edition.

PROJECT. *The Tractor versus the Horse.*

The farmers in the Prairie Provinces contributed the following information to the Experimental Farm regarding their tractor costs:

Tractors were considered profitable in that, (1) they enabled farm work to be kept up to date; (2) they provided power for threshing. They were not considered favorably in that, (1) they cost too much to operate; (2) field work could be done more cheaply with horses. Discuss these points at home and be able to give a report to your class.

The cost of operating a tractor includes such overhead expenses as depreciation, interest, and repairs, as well as the daily cost for fuel, oil, and the charge for the operator.

It is impossible to arrive at absolutely definite figures. The following figures are offered as guides and must be altered to suit each different condition. Horse labor is reckoned at 80 cents per ten-hour day per horse, and man labor at $3 per day. The information attributed an average life of 10.4 years to a two- and three-plough tractor; 11.5 years to a four-plough tractor. The tables at the bottom of this page and the top of the next show the average amount of work done per day and the cost per acre by these outfits.

ACREAGES COVERED PER TEN-HOUR DAY

Operations	Horses			Tractors		
	4-Horse Team	6-Horse Team	8-Horse Team	2-Plough Tractor	3-Plough Tractor	4-Plough Tractor
Ploughing	4.0	5.0	7.0	6.4	9.4	11.0
Discing	12.0	16.0	20.0	20.4	27.6	43.5
Harrowing	30.0	45.0	....	48.7	58.6	87.5
Drilling	20.0	30.0	....	24.6	51.8	52.3
Binding	18.0	27.0	....	21.6	34.1	47.5

COSTS PER ACRE

Operations	Horses			Tractors		
	4-Horse Team	6-Horse Team	8-Horse Team	2-Plough Tractor	3-Plough Tractor	4-Plough Tractor
Ploughing..	$1.55	$1.56	$1.34	$1.47	$1.38	$1.27
Discing.....	.51	.48	.47	.46	.47	.32
Harrowing..	.20	.17	....	.19	.22	.16
Drilling....	.31	.26	....	.38	.41	.26
Binding....	.34	.29	....	.43	.38	.29

Secure the required information from your home and construct problems to be solved by your classmates.

Example:

Compare the cost of ploughing 20 acres using, (1) a 4-horse team; (2) a 2-plough tractor.

CURRICULUM TEST III Grade VIII

Directions: You will be allowed 25 minutes to work the problems below. Work rapidly, but try to have every problem correct. Begin to work when your teacher says, "Start."

Number Correct	.....
Rating.....	.....

Find your rating and continue your Progress Chart.

1. How many sides has a trapezoid? **1. Answer**.....
2. What per cent of a number is the whole of it? **2. Answer**.....
3. At 25¢ a hundred, how much do 80 cookies cost? **3. Answer**.....
4. What fraction represents $37\frac{1}{2}\%$? **4. Answer**.....

5. If the commission on a $100 sale was $15, what were the net proceeds? **5. Answer**.....

6. What is 200% of 45? **6. Answer**.....

7. Write the formula for the area of a triangle. **7. Answer**.....

8. Which is most, 1.5%, 3%, or $.6\frac{2}{3}\%$? **8. Answer**.....

9. Find the cost of sodding a lawn 42 feet long and 10 feet wide at $6\frac{1}{2}¢$ a square foot. **9. Answer**.....

10. A reduction of $15 on a $100 coat is what per cent reduction? **10. Answer**.....

11. At 40 cents a pound for candy and 5 cents each for boxes, what is the cost of 6 half-pound boxes of candy? **11. Answer**.....

12. What is the volume of a two-inch cube? **12. Answer**.....

13. An alloy of silver and copper weighing 54 ounces contains 42 ounces of silver. How much silver is there in 27 ounces of alloy? **13. Answer**.....

14. A collection agent received $260 commission for collecting overdue bills. He charges 10% commission for his services. What is the total of the overdue bills he has collected? **14. Answer**.....

15. Find the area of a circular garden plot whose circumference is 44 feet. **15. Answer**.....

16. Mr. Smith bought a desk at a 25%-off sale. He paid $45 for it. What was the regular price of the desk? **16. Answer**.....

17. A clerk receives a salary of $950 a year. He spends $275 a year for board, $180 for clothing, and $150 for other expenses. What per cent of his salary is left? **17. Answer**.....

18. A grocer sold potatoes for $1.38 a bushel, which was $.18 a bushel more than he paid for them. What per cent of the cost price was the selling price? **18. Answer**.....

19. What is the area of the curved surface of a cylindrical tank, 40 feet long and 17 feet in diameter? **19. Answer**.....

20. How many cubic yards of sand are there in a cone-shaped pile 14 feet deep and 27 feet in diameter? **20. Answer**.....

STANDARDS

Rating.....	1	2	3	4	5	6	7	8
Number Correct.....	0–4	5–6	7–9	10–11	12–14	15–17	18–19	20

SECTION IV

This section on informational arithmetic places much stress on understanding, interpretation and use, as well as on processes and skills. Informational arithmetic serves the purposes of calculation. Understanding is a safeguard against absurdities in computation. The ability to manipulate numbers gives a sense of power and confidence to tackle the problems of life.

Much of the work in this section has been introduced in Grade VII. It is good practice to introduce a topic before the actual formal treatment of it. This is the practice throughout Book One and Book Two.

Page 83.

The topic of profit and loss is fully covered in MANUAL TO ACCOMPANY MATHEMATICS FOR EVERYDAY USE, Book One, pages 75 to 78. A definite technique is given for calculating profit or loss on the cost or on the selling price.

Pages 85 to 88.

Compare the form of the invoice with that of the bill and the account. Note points of similarity and points of difference.

Successive, or chain, discounts are allowed by merchants, especially by wholesale dealers:

1. For promptness in the payment of bills.
2. When costs of production or handling change.
3. For quantity purchases.
4. As preferred customers.

Sometimes it is necessary to calculate the per cent of discount. Always figure the per cent of discount on the original or list price, e.g.;

$20 list price
−16 net price
$4 discount

$4 is what per cent of the list price?

$\frac{4}{20} = \frac{1}{5}$ or 20%.

NOTE.—Divide the discount by the list price.

Check some of the answers to the questions on pages 87 and 88 of the text by working from the discount to the per cent of discount.

Pages 90 to 104.

It is essential that insurance be treated from the informational standpoint. It is doubtful if the pupil will ever be called on to calculate a premium on an insurance policy; but likely he will purchase insurance of some type.

1. This is his first experience with a contract. Bring expired fire-insurance policies to class and from this first-hand information, study the vocabulary, terms and clauses of the contract.

2. List various well known kinds of insurance, as: fire, life, automobile (five point), health and accident, hail, marine, burglary; also some of the less common kinds of insurance, as: unemployment, old age, malpractice, rain, members of the body, as hands, toes, etc.

3. Establish the principle; the greater the risk, the greater the cost.

4. Fire insurance.

a. Board and nonboard companies.

b. How the rates are established for a given locality.

c. Terms under which premiums are collected.
d. Reinsurance of risks.
e. Proof required in case of loss by fire.
f. Nature of reimbursement.

Page 98.

Life insurance is founded on two factors:

1. Tables of expectancy of life at different ages.

2. Compound interest or the ability of money to earn money over a period of years.

a. Study a mortality table such as The American Experience Table of Mortality:

Age Years	Average Future Lifetime Years	Age Years	Average Future Lifetime Years
10	48.7	60	14.1
20	42.2	70	8.5
30	35.3	80	4.4
40	28.2	90	1.4
50	20.9	..	..

At 20 years of age a company expects an insured person to live 42.2 years, and premium rates on Ordinary Life policies are established on that number of payments with allowance made for the earning power of the money paid in premiums.

b. Study the nature of a lien against a policy, functioning only in the case of the death of the insured from some stated cause.

c. Study the different policies from the standpoint of the dividends paid by each.

d. Study such features as: proof of age, relation of weight to the premium paid, borrowing power, conversion clauses, term insurance, double

indemnity, joint policies, group insurance, total disability clause, pension insurance.

e. Study type cases and the kind of policy suitable for each case.

Pages 105 to 112.

The basis of all taxation is assessment in some form.

1. Discuss the purpose of taxes; the collection and expenditure.

2. Kinds of taxes.

a. Direct and indirect taxation.

b. Dominion, provincial, municipal.

3. Principles of taxation. (By W. G. Bennett in *The School.*)

a. Equality—according to person's ability to pay.

b. Certainty—amount, time, place, manner of payment.

c. Convenience—payable at convenience of taxpayer.

d. Economy—collection costs at a minimum.

4. Property tax—single tax and improvement tax.

5. Budgeting and apportioning tax money—establishing the rate, spreading the tax.

6. Penalties for nonpayment of taxes.

7. Sinking funds and their function.

8. Powers of Dominion, provinces, and municipalities to tax.

9. Good citizenship practices. (By W. G. Bennett in *The School.*)

a. Prompt payment of taxes.

b. Honesty in making returns.

c. Conservation of public property.

d. Other practices.

10. Secure from any post office, Dominion Income Tax forms. From your municipal clerk secure such forms as

assessment sheets, tax bills, etc. Place all such material on the bulletin board.

11. Introduce interesting facts about taxation:

a. The per capita debt, the amount that each person owes his province's creditors, taken from the Public Accounts, Province of Quebec, 1935:

British Columbia, $205; Alberta, $204; Prince Edward Island, $52; New Brunswick, $138; Ontario, $170; Manitoba, $165; Saskatchewan, $151; Nova Scotia, $123; Quebec, $43.

b. The following table, compiled by the Citizens' Research Institute of Canada classifies per capita municipal expenditures in Canada in 1934 according to main activities:

CITY	Education	Protection of Persons and Property	Highways, Bridges, Ferries, Etc.	Charities and Correction	Health and Sanitation	Recreation
Victoria	$14.13	$6.97	$5.48	$9.54	$6.38	$0.83
Vancouver	13.23	6.11	9.17	9.61	5.67	1.40
Edmonton	19.55	5.24	2.69	8.85	2.39	1.05
Calgary	16.83	5.05	2.39	10.17	3.46	0.66
Regina	18.42	5.77	4.66	12.23	3.23	1.12
Saskatoon	21.47	5.32	1.86	9.17	2.78	0.87
Winnipeg	13.99	5.92	2.68	10.38	2.99	1.13
Toronto	18.85	8.94	4.07	10.18	5.89	2.46
Hamilton	16.47	5.21	4.00	11.25	5.13	1.34
Ottawa	14.85	5.67	5.53	7.50	4.02	0.84
London	20.28	5.73	4.04	9.12	6.13	0.78
Windsor	12.32	5.32	3.08	3.78	1.15	0.68
Montreal	10.86	6.72	4.42	9.77	2.19	0.65
Quebec	8.42	4.39	4.29	5.10	1.32	0.15
Saint John	14.47	5.37	4.40	5.47	2.95	0.18
Halifax	11.82	6.19	5.85	6.55	4.59	0.58
Charlottetown	4.79	2.06	4.58	1.80	1.65	0.21

The column showing expenditures for debt charges is not included, because in some cases these charges are included in "general administrative costs" in the Institute's bulletin, while in others they are not.

c. Another large item in the civic budget, here and elsewhere, is the cost of education, as the following table, giving per capita taxes in 1934, shows:

CITY	POPULATION	PER CAPITA TAXABLE ASSESSMENT	PER CAPITA TAXES	
			EDUCATIONAL PURPOSES	OTHER PURPOSES
Victoria	39,082	$1,021	$11.50	$33.54
Vancouver	244,329	1,044	13.23	35.90
Edmonton	79,773	708	18.24	37.04
Calgary	83,362	738	15.54	29.82
Regina	53,034	858	17.10	28.18
Saskatoon	43,291	790	19.51	27.81
Winnipeg	223,017	998	13.11	31.09
Toronto	629,285	1,630	17.68	37.79
Hamilton	153,979	1,099	15.41	29.49
Ottawa	137,900	1,141	14.39	32.48
London	74,228	1,170	19.39	29.71
Windsor	63,010	1,049	11.67	28.69
Montreal	847,000	1,129	11.00	28.32
Quebec	143,000	857	8.14	27.98
Saint John	50,000	820	13.56	22.80
Halifax	59,275	988	11.73	24.08
Charlottetown	12,361	742	4.79	11.16

d. Statisticians who have been assembling the cost of government in Canada—federal, provincial, and municipal—find that Canada spends a billion dollars a year on government service of one kind or another. The total net national income is about three billion dollars. One dollar of every three goes to the tax collector to be used as follows:

Debt charges, 35¢; public welfare, 18¢; education, $14\frac{1}{2}$¢; transportation, 9¢; civil service, 8¢; agriculture, forests, etc., $7\frac{3}{4}$¢; administration of justice, 5¢; legislation, $1\frac{1}{4}$¢; all other items, $1\frac{1}{2}$¢.

12. Measure the results of your teaching by oral tests, written tests, summary, outline, or essay.

Pages 113 to 116.

Custom duties and excise duties in textbooks can be approximate only since changes take place in these rates quite frequently. Sweeping changes were made (1) by the Canada-United States Trade Treaty of January 1, 1936, and (2) in the Budget of May 2, 1936. Some outstanding changes are:

1. All automobiles, imported from the United States, will pay $17\frac{1}{2}$ per cent duty, the old rates running as high as 30 per cent, depending on value. (Free, $17\frac{1}{2}\%$, $27\frac{1}{2}\%$.)
2. Gasoline tariffs were cut from $2\frac{1}{4}$ cents a gallon to 1 cent.
3. The duty on American farm implements were cut to $7\frac{1}{2}$ per cent, as compared to 25 per cent previous to January 1, 1936. (Free, $7\frac{1}{2}\%$, 25%.)
4. Duty exemption up to $100 on goods for personal use brought in to Canada by tourists traveling abroad providing they are absent 48 hours and that exemption is granted only once every four months.
5. Mowers. (Free, $7\frac{1}{2}\%$, 25%.)
6. Crude petroleum, per gallon, $\frac{1}{3}$¢, $\frac{1}{2}$¢, 1¢.

The general tariff rates are those applied to goods originating in countries which have no trading arrangement

with Canada. Intermediate rates are accorded countries under trade agreements and are accorded countries with which Canada has "most favored nation treaties." The British preferential rates are those accorded British countries under agreements, latest of which were signed at the Ottawa Imperial Conference in 1932.

Outstanding changes in excise duties were:

1. From 5% and 10%, on automobiles imported or produced in Canada, with certain exemptions, to a flat rate of 5% on all automobiles regardless of Canadian or Empire content, on values in excess of $650 (no tax to exceed $250). At the same time the sales tax was increased from 6% to 8%.

2. Tires and tubes are not subject to excise tax when from 50% to 60% of factory costs is incurred in the British Empire.

3. Excise tax on Canadian brandies from $4 a gallon, reduced to $3 a gallon.

a. Discuss the terms of the Ottawa Imperial Conference in 1932.

b. Discuss the terms of the United States Trade Treaty with Canada, January 1, 1936.

c. Discuss the sweeping downward revision of custom duties, May 2, 1936.

Pages 117 to 137.

The study of banking should include:

a. Origin and history of banking in Canada. (See MANUAL TO ACCOMPANY MATHEMATICS FOR EVERYDAY USE, Book One, pages 48 to 52.)

b. Services rendered by banks.

c. Regulation of banks.

1. Charters of all banks renewable for only ten years.

2. Capital of $500,000 and actual payment of $250,000 to the Minister of Finance before a charter is granted.

3. Shareholders are subjected to what is known as "double liability."

4. Note-issuing power not to exceed the aggregate of the unimpaired paid-up capital of a bank and the amount of gold coin or Dominion notes held for it in the Central Gold reserve. This may be increased 15% at crop moving season. No notes in denominations smaller than five dollars, or for sum not a multiple of five dollars. Banks may pay all liabilities in their own notes.

5. Bank Circulation Redemption fund. Each bank deposits 5% of its average circulation, to meet instant liquidation in case of the failure of any bank to redeem its note issue.

6. The clearing house.

d. Place of the bank in modern life.

e. Banking forms such as, deposit slips, cheques, bank book, draft, etc.

f. Savings account, current account, joint accounts, trust accounts.

g. Post office bank, trust and loan companies, savings certificates.

h. How to secure a loan at a bank.

1. Nature of security required.
2. Terms of a loan.
3. Indorsing a note.

NOTE.—Any bank will supply you with an abundance of free literature on the topic of banking.

CURRICULUM TEST IV GRADE VIII

DIRECTIONS: You will be allowed 25 minutes to work the problems below. Work rapidly, but try to have every problem correct. Begin to work when your teacher says, "Start."

Number Correct	.....
Rating.....	.....

Find your rating and continue your PROGRESS CHART.

1. What fraction of a pound is four ounces? **1. Answer**.....
2. What is 10% of 75? **2. Answer**.....
3. At 2 for 5¢, how much do 16 papers cost? **3. Answer**.....
4. Express $62\frac{1}{2}\%$ as a fraction **4. Answer**.....
5. How many degrees are there in each angle of a square? **5. Answer**.....
6. Write the formula for the area of a circle. **6. Answer**.....
7. How many faces has a cube? **7. Answer**.....
8. Which is most, $\frac{3}{4}$, $\frac{7}{8}$, or $\frac{5}{6}$? **8. Answer**.....
9. A passenger train travels 300 miles in 8 hours. At the same average rate an hour, how many miles can it travel in 12 hours? **9. Answer**.....
10. Each $\frac{1}{8}$ of an inch on a map in Lucy's book represents 10 miles. What is the distance represented by a line on the map $1\frac{3}{4}$ inches long? **10. Answer**.....

11. Which is least, 7%, .2, or .15? **11. Answer**.....

12. Which is larger, an acute, a right, or an obtuse angle? **12. Answer**.....

13. If a bushel of ear corn takes up $1\frac{1}{2}$ cubic feet, how many bushels will a bin 15′ x 14′ x 8′ hold, level full? **13. Answer**.....

14. Mr. Smith bought a desk at a 25%-off sale. He paid $45 for it. What was the regular price of the desk? **14. Answer**.....

15. A contractor ordered 5 kegs of nails, 50 pounds to a keg. The cost was $4\frac{1}{2}$ cents a pound, less 10% for cash. Find the net cost for cash. **15. Answer**.....

16. Find the date of maturity of a 90-day note dated March 4, 1930. **16. Answer**.....

17. What is the cost of 5 pounds of butter if $\frac{3}{4}$ pound costs 30 cents? **17. Answer**.....

18. Mr. Smith buys a farm at a cost of $7,500. He pays $1,500 in cash and gives a note for the balance at 6%. What are the monthly interest charges? **18. Answer**.....

19. What is the volume of a box, the base of which is 18 inches square and the height 9 inches? **19. Answer**.....

20. Find the interest on a $250 note dated May 2, 1929, and paid August 15, 1929, interest at 6%.

20. Answer.....

STANDARDS

Rating.....	1	2	3	4	5	6	7	8
Number Correct.....	0–3	4–6	7–10	11–12	13–15	16–17	18	19–20

SECTION V

When you solve a problem you either have to reason out your solution, or you use a rule made by someone else who has solved it. Much time is wasted if the pupil has to reason each time a solution is needed. On the other hand there is the danger that the pupil will work too much by rule instead of by reason.

The old formal method of teaching algebra is gone, and with it many of the abstract processes. The subject is now developed from the equation or from the formula. If from the equation, our unknown has a definite value; if from the formula, our unknown has any value, so we give it a sensible value and note the results.

The authors of the textbook have chosen to develop from the formula. Since algebra is merely the applying of the rules and principles learned in arithmetic in literal numbers, frequent reference should be made to his arithmetic work to obtain an understanding of a new situation in algebra. The authors use an elementary problem situation where the total cost of a number of items is equal to the price of one item times the number of items purchased, or $c = np$. Every general rule in arithmetic or mensuration may be classed as a formula.

When integers are substituted for the literal numbers in a formula, the formula is said to be evaluated. This work, found on page 141, constitutes our second step in understanding formulas.

On page 142 we find our third step in practical applications of the formula.

On page 144 we get generalizations arrived at by inspection or analysis as, $4s = P$. Negative numbers should not be considered at this stage.

Page 144.

It is essential that the pupils understand how the formula gives an equation. The formula $4s = P$ is true for all values of P. When P is replaced by the particular number 24 (Exercise 11), the s is called the unknown. The value of s that satisfies the equation, that is, when substituted makes both sides have the same value, is called the *root* of the equation.

Page 145.

Answers to simple equations should be checked by substitution. Since checking, if arranged like the solving, will commonly repeat any mistakes made in the solution; it is better to substitute in the left side, then in the right side to prove the equality. This is an important habit to form for future work, more than for work in Grade VIII.

Example 3. $i = prt$ $\quad \$60 = \$500 \times r \times 2$ $\quad$ If $r = 6\%$

$i = \$60$ $\quad prt = 500 \times .06 \times 2 = \$60$

The topic of changing the subject of a formula (transposing a formula) might quite well be developed here. In Example 2, $V = lwh$, divide both sides by lw: $\frac{V}{lw} = \frac{lwh}{lw}$ or $\frac{V}{lw} = h$. Give considerable practice in transforming formulas such as those found on page 144.

Page 146.

Teachers are requested to read pages 105 to 109 in Manual to Accompany Mathematics for Everyday Use, Book One. Much helpful review material is found on these pages.

Pages 150 to 154.

NOTE CAREFULLY: Teachers who prefer a study of directed numbers previous to the solution by the four axioms, should turn to pages 164-168 and do the work outlined there before that on page 150.

It is a matter of observation that a pupil at this stage attaches little meaning to abstract statements such as those found under a, b, c, and d on page 154. Do not ask the pupils to memorize these statements, but lead them to arrive at them as generalizations of easy numerical cases. The pupil should be able to explain his solution in words, in all early examples. The time must be reached when he transposes terms and uses such statements as:

1. "Signs are changed when terms are moved from one side of an equation to the other."
2. "When solving a fractional equation, cross-multiply, transpose, and evaluate."

It is wise to postpone this later stage for some time.

On page 154, the fourth mathematical law has obviously one limitation, the number used as divisor must not be zero. Why?

NOTE.—The illustrative material for the fourth mathematical law is found on pages 144–145.

Page 156.

Study the following formula. Note the similarity of the discount formula and the commission formula to the interest formula:

Discount = price × rate per cent $D = pr$
Commission = price × rate per cent $C = pr$
Interest = principal × rate per cent × time $I = prt$

In interest we introduce a new element, namely *time*.

Page 161.

Freliminary to the work on this page, it is wise to introduce the idea of functional relationship by showing dependence in formulas. In a formula there is a number whose value depends on the value given to the other numbers:

In the formula $c = np$, show the effect on c when:

1. n is doubled, trebled, etc.
2. p is doubled, trebled, etc.
3. both n and p are altered, n doubled and p doubled; n doubled and p trebled; n doubled and p halved.
4. n equals p.

More work of this type should be attempted.

The authors develop graphs of functions naturally from statistical graphs through the medium of "ready-reckoners." The graph found on page 161 represents simple functional relations, although the function is not expressed in algebraic form.

When constructing this graph of $c = .20\,n$, it is wise to prepare a table as follows:

When n is	0	1	2	3	4	5	6	7	8	9	10
Then c is	0	.20	.40	.60	.80	1.	1.20	1.40	1.60	1.80	2.

Notice that all the points located are in a straight line.

NOTE.—Turn to page 119 and study the interest graph (4%).

Pages 164 to 168.

The first step in directed numbers taken by the authors is to show why positive and negative numbers are

employed. The thermometer is used. Fahrenheit placed the bulb of his thermometer in a freezing mixture of ammonium chloride and chopped ice and when the mercury stopped falling he called that point 0°. He divided the space between 0° and blood heat into 12 degrees. Later he divided each degree into 8, placing the supposed blood heat at 96 degrees. 0° was the lowest temperature he was able to obtain. When lower temperatures than 0° F. were obtained, the use of negative numbers was made necessary.

A foot rule or yard stick shows the distance on the scale from the starting point. In an arithmetic scale you are concerned only with how far. An algebraic scale shows distance and direction. For this reason the symbols are said to represent directed numbers.

Page 167.

After you have studied proportion on page 203, return to page 167 and make the development of these formulas meaningful as follows:

$$\frac{C}{F-32} = \frac{100}{180}$$

$$180\,C = 100(F-32)$$

$$C = \frac{100(F-32)}{180}$$

$$= \tfrac{5}{9}(F-32)$$

or

$$\frac{C}{F-32} = \frac{100}{180}$$

$$100(F-32) \doteq 180\,C$$

$$F - 32 = \frac{180\,C}{100}$$

$$F = \tfrac{9}{5}\,C + 32$$

SURVEY TESTS

Set 1

1. Mr. Brown brought an automobile priced at $1,625, and paid 60% in cash. He gave two notes of equal amount for the balance; one legally due in 90 days, and the other in 6 months with interest at 6%. How much did the automobile actually cost him? (*Ans.* $1,639.87)

2. At the Medford Shirt Company the following attractive sale is advertised:

95¢ Silk Ties reduced to 55¢
$1.00 Madras Athletic Jerseys reduced to 65¢
55¢ Fancy Hose at a discount of 22%
$2.00 Broadcloth Shirts reduced to $1.35
Discount on $6.00 Flannel Robes $2.05

a. How much less than the regular price of each article is the sale price?

b. What is the rate of reduction on each offering?

c. If one article of each kind is purchased, what is the rate of reduction on the order?

(*Ans. a.* 40¢; 35¢; 12¢; 65¢; $2.05. *b.* 42.1%; 35%; 21.8%; $32\frac{1}{2}$%; $34\frac{1}{6}$%. *c.* 33.1%.)

3. A meter equals 39.37 inches. What fraction of a meter is a yard? (*Ans.* $1\frac{337}{3600}$ or 1.093)

4. A pail weighs 4.5 pounds, and holds $2\frac{1}{2}$ gallons. How much will it weigh filled with milk if 1 quart of milk weighs 2.58 lb.? (*Ans.* 30.3 lb.)

5. A cubic foot of water weighs $62\frac{1}{2}$ pounds. Water expands $\frac{1}{10}$ of its original volume in freezing. The ice

chamber of a refrigerator is $2\frac{1}{2}' \times 2' \times 1'$. Supposing that the ice compartment could be completely filled with ice, what would this ice weigh? (*Ans.* 281.25 lb.)

6. If the taxes on a home assessed at \$5,000 amount to \$200, what is the rate of taxation on the dollar expressed in mills? (*Ans.* 40 mills)

7. A retail grocer paid a bill of \$600, after deducting discounts of 10% and 2%. What was the amount the grocer paid? (*Ans.* \$529.20)

8. A manufacturer of cloth in the United States imported 5,000 pounds of Australian wool and paid \$4.80 a pound. What import duty did he pay at 25% ad valorem? (*Ans.* \$6,000)

9. How much more than the simple interest on \$400 at 6% per annum. is the compound interest at the same rate for a period of 3 years, if interest is compounded annually? (*Ans.* \$4.41)

SET 2

Match the statements below with the equations. Show why the equation you select is the correct one.

A. STATEMENTS	EQUATIONS
1. The cost of 5 oranges is 15 cents.	a. $3n = 180$
2. The weight of three chickens is $12\frac{1}{2}$ pounds.	b. $5c = 15$
3. The number of minutes in 3 hours is 180.	c. $2n + 3 = 12$
4. A certain number is 4 more than 15.	d. $3w = 12\frac{1}{2}$
5. Two times a number plus 3 is 12.	e. $n - 4 = 15$
6. The distance across a river is a feet.	f. $bc = n$
7. n apples cost 25 cents.	g. $ab = 16$
8. b baseballs cost n cents.	h. $d = a$
9. The product of a and b is 16.	i. $nc = 25$
10. Five more than two times a number is 16.	j. $2n + 5 = 16$

Make up five statements of your own like these and write the equations.

B. Tell what operations were used to obtain the formulas in column two, from those in column one.

Column One	Column Two
1. $A = ab$	$\frac{A}{a} = b$
2. $V = lwh$	$\frac{V}{lw} = h$
3. $V = \frac{lwh}{3}$	$\frac{3\,V}{lh} = w$
4. $C = \pi d$	$\frac{C}{d} = \pi$
5. $A = P + Prt$	$\frac{A - P}{Pr} = t$
6. $S = M - Md$	$\frac{S}{1 - d} = M$
7. $P = 2\,l + 2\,w$	$\frac{P - 2\,l}{2} = w$
8. $A = \pi r^2$	$\frac{A}{r^2} = \pi$
9. $S = 2\,\pi r^2 + 2\,\pi rh$	$\frac{S - 2\,\pi r^2}{2\,\pi r} = h$
10. $S = 2\,lw + 2\,lh + 2\,wh$	$\frac{S - 2\,lw}{2\,l + 2\,w} = h$

C. Solve each of these equations for the letter indicated:

1. $c = 2\,x$, for x.
2. $a = bc$, for b.
3. $b = cde$, for d.
4. $a = \frac{bc}{2}$, for b.
5. $b = c - cd$, for c.
6. $c = \frac{deg}{3}$, for d.
7. $c = a + ab$, for b.
8. $c = a + ab$, for a.
9. $b = c + cd$, for d.
10. $y = 2\,m + 2\,n$, for m.
11. $e = 2\,ab + 2\,ac + 2\,bc$, for c.
12. $e = 2\,ab + 2\,ac + 2\,bc$, for b.

Set 3

Solving problems by the use of formula.

1. Distance = rate of speed × the length of time i motion, or $d = rt$. If a transcontinental train travels a an average rate of 34 miles an hour, how long will it tak to travel 238 miles? (*Ans.* 7 hrs.

2. A taxicab company makes an initial charge of 25 and 10¢ for each additional half-mile. The fare is recorde on a meter. The formula may be written $F = .25 + .20\,m$ in which F represents the fare and m the number of miles The fare from Mr. Jones' house to his office is 75¢. Hov many miles is it? (*Ans.* $2\frac{1}{2}$ miles

3. A represents the average; a, b, and c represen three numbers to be averaged; 3 is the number of item averaged. $A = \frac{a + b + c}{3}$. On Monday Marion's mark in mathematics was 60; on Tuesday 90; on Wednesday 100; on Thursday 98; and on Friday 80. Find the average mark for the week. (*Ans.* $85\frac{3}{5}$

4. A formula for determining the normal weight of an adult over five feet tall is $W = \frac{11(d + 20)}{2}$. In this formula W represents the normal weight in pounds and d the number of inches over five feet in a person's height. Use the formula to fill out the table:

Height	Weight	Pounds Over-weight	Per Cent Over-weight	Pounds Under-weight	Per Cent Under-weight
a. 5 ft. 1 in.	130 lb.				
b. 5 ft. 11 in.	158 lb.				
c. 6 ft. 1 in.	170 lb.				
d. 5 ft. 5 in.	$137\frac{1}{2}$ lb.				
e. 5 ft. 6 in.	$146\frac{1}{2}$ lb.				

5. A formula for finding commission is $C = rs$, in which r = rate of commission and s = total sales. A real-estate broker sold a house for \$8,500. His commission was 3% on the first \$5,000 and 2% on the remainder. What was the total amount of his commission?

(*Ans.* \$220)

6. Use the formula $t = rv$, in which t = taxes, r = rate, and v = assessed valuation, to solve the following problem: What was the assessed valuation of a house on which the taxes were \$200 and the rate of taxation \$.025?

(*Ans.* \$8,000)

7. The amount formula is $A = P + Prt$, where A represents the amount, P the principal, r the rate, and t the time. This formula may be written $t = \frac{A - P}{Pr}$. The amount of a \$200 promissory note at 6% interest a year is \$236. What is the time of the note? (*Ans.* 3 yr.)

8. In $S = m - md$, S is the selling price, m is the marked price, and d is the per cent of discount. This formula may be written $d = \frac{m - S}{m}$. Find the rate of discount on a \$75 suit of clothes sold for \$50.

(*Ans.* $33\frac{1}{3}$%)

9. In the formula $A = \frac{ab}{2}$, A is the area, a the altitude and b the base of any triangle. The area of a triangle is 20 square inches and the altitude is 5 inches. Find the base. (*Ans.* 8 in.)

CURRICULUM TEST V GRADE VIII

DIRECTIONS: You will be allowed 25 minutes to work the problems below. Work rapidly, but try to have every problem correct. Begin to work when your teacher says, "Start."

Number Correct	.....
Rating.....	.....

Find your rating and continue your PROGRESS CHART.

1. Mr. Smith buys a house at a cost of $8,000. He pays $3,500 in cash and gives a note for the balance at 6%. What are the annual interest charges? **1. Answer**.....
2. Give the formula for finding the area of a circle. **2. Answer**.....
3. Give the formula for finding the area of a triangle. **3. Answer**.....
4. Find the average weight for 4 chickens whose total weight is $16\frac{1}{2}$ pounds. **4. Answer**.....
5. Give the formula for finding the volume of a cylinder. **5. Answer**.....
6. An agent sold a 120-acre farm for $180 an acre. What is his commission at $3\frac{1}{2}\%$? **6. Answer**.....
7. Tomatoes were purchased at $1.60 a bushel and sold at $.40 a half peck. What was the margin a bushel? **7. Answer**.....
8. How much less than a right angle is a 60° angle? **8. Answer**.....

9. A 60-day note for $1,400 bears interest at 6%. What amount must be paid when the note falls due?

9. Answer.....

10. Which is largest, $\frac{7}{8}$, .9, or 86%?

10. Answer.....

11. Express the ratio of 16 to 48 as per cent.

11. Answer.....

12. Give the formula for finding the area of a trapezoid.

12. Answer.....

13. What will be the cost of cementing a triangular piece of ground at $1.20 a square yard if the dimensions are, base 40 feet, altitude 25 feet?

13. Answer.....

14. Mrs. Smith bought 8 travellers' checks of $20 each, 6 of $10 each, and 4 of $100 each. How much did all the checks cost, including the usual fee of $\frac{3}{4}$%?

14. Answer.....

15. A 60-day trade acceptance for $270 was discounted by a bank at 6%. What were the proceeds?

15. Answer.....

16. Give the formula for finding the volume of a sphere.

16. Answer.....

17. What is the area of the curved surface of a cylindrical tank, 40 feet long and 18 feet in diameter?

17. Answer.....

18. On April 1, 1931, Mr. Bank wished to find the number of

days that remained on a 3-month note, dated March 4, 1931. How many days were left?

18. Answer.....

19. Give the formula for finding the amount of a loan.

19. Answer.....

20. What is the compound interest on \$500 for 3 years at 6% a year compounded annually?

20. Answer.....

STANDARDS

Rating.....	1	2	3	4	5	6	7	8
Number Correct.....	0–1	2–3	4–6	7–9	10–12	13–15	16–17	18–20

SECTION VI

From the beginning, pupils should be encouraged to apply the draftsman's techniques to their work. A sharp point in the pencil end of the compass is essential if accurate measurements are to be made. Trace lightly at first so that the lines are easily erased if necessary.

Neatness and accuracy are fundamentally basic in geometric construction and measurement. Measurements should be made with compasses and dividers, when possible. An important feature to watch is the proper placing of the work on the page; proper spacing pleases the eye and leads to an economy in the amount of paper used.

Where books are available, review pages 133 and 134 in MATHEMATICS FOR EVERYDAY USE, Book One. Teachers are urged to read pages 84 to 93 in the MANUAL TO ACCOMPANY MATHEMATICS FOR EVERYDAY USE, Book One.

Page 173.

Supplementary exercises addressed to the pupils:

1. Draw to scale the plan of a volley ball court or baseball diamond. Look up the dimensions.

NOTE.—A volley ball court is a rectangle 60 ft. long by 25 ft. wide. The serving line is 5 ft. in front of each end line, while the net is 30 ft. in front of each end line. A baseball diamond is a square, 90 ft. between bases.

2. Draw to scale the floor plan of three adjoining rooms in your home.

3. Measure the lot on which your house is located and find its area. Make a scale drawing of the lot.

4. Draw to scale the floor plan of a summer cottage you would like to own.

5. Draw to scale the front yard of a house, showing walks, shrubs, and flower beds of various shapes.

6. Make a drawing of a pattern of linoleum (see Book One, page 141).

7. Use the map scale and find (*a*) the air-line distances between cities in Canada, (*b*) the lengths and widths of Lakes Huron, Ontario, Erie, Michigan, and in the Northwest Territories, Great Bear and Great Slave lakes.

NOTE.—The area of these last two lakes is larger in each case than the area of Lake Ontario or Lake Erie.

8. Suppose an error of $\frac{1}{4}$ of an inch were made in measuring on a map the distance between two places. Using the map scale, express the error in miles.

Pages 175 and 176.

Check the accuracy of the work by using, (1) the protractor, (2) a right triangle.

Pages 177 to 180.

In preparation for the theoretical geometry in Grade IX, give some practice in constructing angles and triangles freehand to certain measurements and shapes. Measure the angles and sides to see how accurate the eye has been.

Pages 181 and 182.

Carry the idea of congruence beyond the triangle. Things which have the same size and shape are congruent (from the Latin, *congruere*, to agree). Cookies cut by the same cutter are congruent. The dressmaker's pattern,

a stencil, and all duplicating devices give commercial application of congruence. Standardization of parts for machines is based on congruence; a broken part may be replaced only by a congruent part.

Pages 183 to 189.

These pages begin, in Grade VIII, what we might term "Boy Scout" geometry. Our previous work in measurement has had to do with direct measurement. Obstacles such as rivers, hills, trees, lakes, buildings, and arm reach make it impossible to measure a distance or height directly. The knowledge gained on pages 181–182, when triangles are congruent, forms the basis for the use and congruent triangles in measuring angles and distances indirectly.

The construction of a field protractor is described on page 135, MATHEMATICS FOR EVERYDAY USE, Book One. It is used for measuring angles, either in the vertical or in the horizontal. Study the drawing and construct a field protractor as a class project. With this instrument and a 50-foot measuring tape, you will be able to do exercises similar to those outlined in the textbook.

Pages 199 to 209.

On page 173 we studied drawing figures to scale. Each line in the drawing was a certain specified fraction of the actual length. Two or more figures which differ merely in the scale used in drawing them are said to be similar. Similar figures have the same shape, but not the same size. Industry and commerce employ this geometric idea in many instances:

1. Enlargement of a kodak picture.
2. Geographic charts for navigation.

3. Blueprints for architects and builders.

4. Maps for surveyors.

5. Shoes, hats, suits, flags, cooking utensils, window blinds, etc. One style but several sizes.

NOTE.—An interesting application is found in the way in which astronomers find the height of the atmosphere. When a meteor enters the atmosphere of our planet it "glows" due to friction. Two observatories, a known distance apart, view the meteor as it enters the atmosphere. The angle of elevation of the meteor is taken at each observatory. A scale drawing is made. The altitude of the resulting triangle is found and converted from the scale to the same unit used in measuring the distance between the two observatories.

An equation whose members are equal ratios is called a *proportion.* A proportion may be written either in the form $\frac{a}{b} = \frac{c}{d}$ or in the form $a:b = c:d$, and both are read, "a is to b as c is to d." In our textbook we deal only with the proportion with its ratios in the fractional form. Such a proportion is equivalent to a fractional equation and all the operations which may be performed upon a fractional equation may also be performed upon a proportion. Each member is a fraction, so each term in the member may be multiplied or divided by the same number without changing the value or quotient.

Page 202.

Supplementary Exercises:

In making the following constructions, use the fact which you have just learned: "Two triangles are similar if two angles of one triangle are equal to two angles of the other triangle."

1. Draw a triangle. Construct a triangle similar to it but not equal to it.

2. Construct a triangle having two sides 2 inches and 3 inches, respectively, and the included angle 60°. Construct a triangle similar to it.

3. Construct a triangle having sides 2 inches, 3 inches, and $3\frac{1}{2}$ inches. Construct a triangle similar to it.

4. Draw two triangles of different size, whose angles are 40°, 50°, and 90°. Measure their sides to the nearest eighth of an inch. Find the ratios of the corresponding sides of the two triangles you have drawn.

Page 205.

Supplementary Problems:

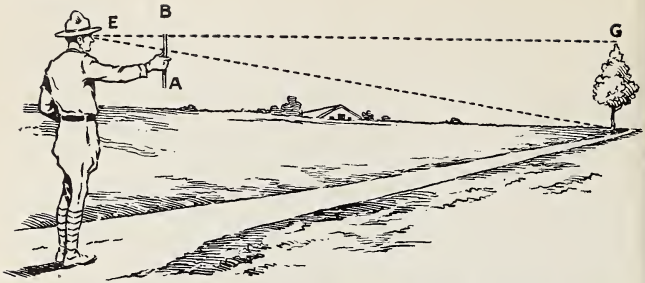
1. Concrete used to surface roads is made of cement, sand, and crushed stone. The proportions most frequently used are, by volume, 1 part cement, 2 parts sand, and 4 parts crushed stone. What fractional part of this concrete is cement? sand? crushed stone?

2. Cement is put up in sacks weighing 100 pounds and containing nearly 1 cubic foot of cement. How many cubic feet of sand and crushed stone must be mixed with 20 sacks of cement to make concrete of the proportions given in Problem 1?

3. How many cubic yards each of cement and stone must be mixed with 56 cubic yards of sand to make concrete of the proportion 1:2:4, as in Problem 1?

4. If the proper amount of water is added to a mixture of cement, sand, and stone, the volume shrinks about 20%. Suppose the proper proportions of sand, stone, and water are added to 1 cubic yard of cement to form a 1:2:4 mixture. How many cubic yards of concrete will be made?

Page 209.



HOW A BOY SCOUT ESTIMATES DISTANCES *

On page 186 you read of a method used by Girl Guides to estimate the height of an object. The above picture illustrates another method of finding heights which, though not as accurate, is more convenient.

Boy Scouts are taught to know their reach. Tom, the boy in the picture, has a reach of $2\frac{1}{2}$ feet. He is standing 180 feet from the tree. The length sighted off on the stick is 6 inches.

Since triangles EAB and EFG are similar,

EB (the length of Tom's reach) : EG (the distance of Tom from the tree) = AB (the length of the stick) : FG (the height of the tree). This proportion written as a fraction is

$$\frac{EB}{EG} = \frac{AB}{FG}.$$

Hence, $\dfrac{\text{The length of the stick} \times \text{distance from the tree}}{\text{The length of Tom's reach}} =$

height of tree $= \dfrac{\frac{1}{2} \times 180}{2\frac{1}{2}} = 36$ feet.

1. Jack is measuring the height of a tree 200 feet distant. The height sighted on the stick is 3 inches. Jack's reach is $2\frac{1}{2}$ feet. Find the height of the tree.

CURRICULUM TEST VI GRADE VIII

DIRECTIONS: You will be allowed 25 minutes to work the problems below. Work rapidly, but try to have every problem correct. Begin to work when your teacher says, "Start."

Number Correct	.....
Rating.....	.....

Find your rating and continue your PROGRESS CHART.

1. Is a $100 stock sold for $102\frac{1}{2}$ sold at, above, or below par? **1. Answer**.....
2. At $2.00 a hundred, how much do 600 pictures cost? **2. Answer**.....
3. A $100 bond sold for 98 is sold for how much less than par? **3. Answer**.....
4. Which is most, 2.5%, 15%, or .13? **4. Answer**.....
5. How much is 100% of $368\frac{1}{2}$? **5. Answer**.....
6. What is the area of a triangle, base 5 inches and altitude 4 inches? **6. Answer**.....
7. Write the formula for the area of a circle. **7. Answer**.....
8. How many corners has a cube? **8. Answer**.....
9. Mr. Smith bought a desk at a sale. The regular price was $60. Mr. Smith paid $45 for it. What was the per cent reduction? **9. Answer**.....
10. Are shares of stock always, never, or sometimes valued at more than $100? **10. Answer**.....

11. What is the monthly interest on $7,500 at 6% a year? **11. Answer**.....

12. Find the date of maturity of a 90-day note, dated March 2. **12. Answer**.....

13. The list price of a piano is $600. Trade discounts are 15% and 10%. What is the net price? **13. Answer**.....

14. What fraction of a square foot is a square inch? **14. Answer**.....

15. What is the volume of a cylinder whose diameter is 21 feet and height 20 feet? **15. Answer**.....

16. Find the proceeds of a 90-day note for $600 discounted at the rate of 6%. **16. Answer**.....

17. How much more than the simple interest on $400 at 6% per annum is the compound interest at the same rate for a period of 3 years, if interest is compounded annually? **17. Answer**.....

18. A utility company pays quarterly dividends of $1\frac{3}{4}\%$. I have 60 shares of this stock, par value being $100. What annual income do I receive from this investment? **18. Answer**.....

19. I pay $110 for a $100 stock paying a dividend of $5\frac{1}{2}\%$. What is the rate of return on my investment? **19. Answer**.....

20. A man bought 5 thousand-dollar bonds at $98\frac{3}{4}$. Find the total cost including brokerage at \$1.50 a \$1,000.

20. Answer.....

STANDARDS

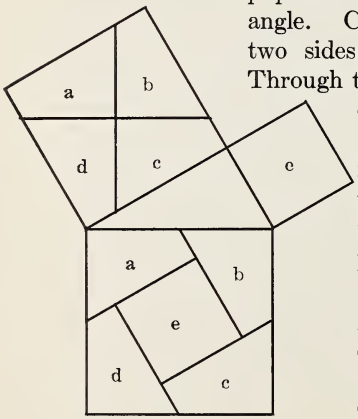
Rating.....	1	2	3	4	5	6	7	8
Number Correct.....	0–4	5–7	8–9	10–12	13–15	16–17	18–19	19–20

SECTION VII

Introductory to this section, review the multiplication facts: 1×1, 2×2, 3×3, 4×4, 5×5, 6×6, 7×7, 8×8, 9×9, 10×10, 11×11, 12×12. Some teachers continue this work to 25×25. In this manner, the square roots of all perfect squares to 625 are ready for instant recall.

Page 218.

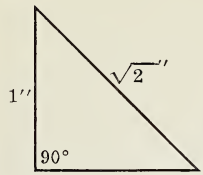
A practical demonstration of the truth of Pythagoras' Theorem will help to impress the fact on the minds of the pupils. Draw a right-angled triangle. Construct squares on the two sides about the right angle. Through the point where the diagonals of the square on the longer of the two sides meet, draw a line parallel to the hypotenuse of the triangle and a second line perpendicular to this line. Cut out the four equal parts into which the square has been divided and place the parts in the corners of the square on the hypotenuse as shown.

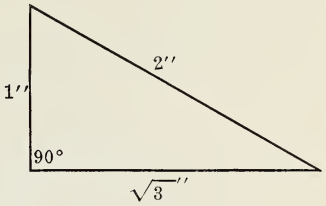


Insert the square on the other side about the right angle in the space left for it.

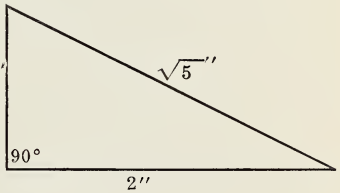
Page 219.

We can find the approximate square roots of the numbers 2, 3, and 5 by using the Principle of Pythagoras.





Measure these lines as accurately as possible.



There are many numbers which can be factored into 2, 3, or 5. If the square roots of 2, 3, and 5 are memorized, the square roots of these numbers may be found very quickly:

$\sqrt{2} = 1.414$ $\sqrt{3} = 1.732$ $\sqrt{5} = 2.236$

Illustrations.

a. $\sqrt{125} = \sqrt{5 \times 25} = \sqrt{5} \times \sqrt{25} = (2.236) \times 5 = 11.180$

b. $\sqrt{243} = \sqrt{3 \times 81} = \sqrt{3} \times \sqrt{81} = (1.732) \times 9 = 15.588$

Solve the following using the square roots of 2, 3, and 5:

1. $\sqrt{75}$	6. $\sqrt{45}$	11. $\sqrt{243}$	16. $\sqrt{20}$
2. $\sqrt{98}$	7. $\sqrt{12}$	12. $\sqrt{288}$	17. $\sqrt{8}$
3. $\sqrt{48}$	8. $\sqrt{128}$	13. $\sqrt{363}$	18. $\sqrt{27}$
4. $\sqrt{108}$	9. $\sqrt{162}$	14. $\sqrt{180}$	19. $\sqrt{405}$
5. $\sqrt{125}$	10. $\sqrt{242}$	15. $\sqrt{192}$	20. $\sqrt{147}$

Page 220.

The graph of X^2 provides a ready-reckoner for reading off the squares of a given number; also for extracting square root. Construct this graph. Label the respective axes "Values of X" and "Values of X^2." This is a curved-line graph (see page 69 in your textbook).

When X is.....	0	1	2	3	4	5	6	7	8	9	10
Then X^2 is.....	0	1	4	9	16	25	36	49	64	81	100

To find the approximate square root of a number, locate that number on the horizontal axis and follow the corresponding vertical line to the curve. Neglect the negative square root in this grade.

Pages 227 to 230.

Preliminary to this unit of work, turn back to page 54 and review how to find the number of board feet in lumber measurement. Add interest to this work by finding costs of lumber locally and figuring the lumber bill.

2. *c.* 8″-siding is generally given a 3″ or 4″ lap. This does not enter the calculation since you merely count the number of boards shown in the diagram.

PROJECT. *The Mathematics of Light and Sight.*

1. Good house planning demands that an area equal to $\frac{1}{5}$ of the floor space be given to windows in living rooms. Check this feature in your home.

2. Electric lamps are arranged so that there will be sufficient light where it is needed in a room. The unit of illumination, the foot candle, is the illumination at a point 1 foot from a standard candle. If we double the distance from the light, the intensity of illumination will

be one fourth as great, or we require 4 standard candles to get the same intensity of illumination. At 3 feet we need 9 standard candles, at 4 feet we need 16 standard candles, at 5 feet we need 25 standard candles, etc. An instrument called a *sight-meter* measures the exact intensity of illumination. Low-powered lamps are less efficient than higher-powered lamps. Use the following equivalences:

20 watts.....	16 c. p.	60 watts.....	50 c. p.
25 watts.....	20 c. p.	75 watts.....	65 c. p.
40 watts.....	35 c. p.	100 watts.....	100 c. p.

a. Illumination in the sun measures 10,000 foot candles, in the shade outdoors about 1,000 foot candles. The illumination on the bench in a factory was found to be $2\frac{1}{2}$ foot candles. What is the ratio of this illumination to that of daylight (1) in the sun? (2) in the shade?

b. What power electric lamp would you substitute at a five-foot distance for a four-candle power lamp at a distance of 1 foot?

c. For studying, a minimum of 25 foot candles is necessary on the page to avoid eyestrain. Indicate different arrangements of power and distance to secure this intensity of illumination. Make drawings to illustrate.

d. Glare is harmful as it causes eyestrain. Study the effect of the following on eyestrain:

1. Smooth paper or smooth, shiny surfaces.
2. Position in which a book is held while reading.
3. Flickering lights.
4. Place a mirror on the page of your book. If it reflects the bulb, there is glare. Shift the

lamp until the mirror no longer reflects the lamp.

5. It is not the amount of light that bothers one, but the contrast with surrounding darkness. Light an indirect lamp in the room and note the difference.

3. Business streets outside of window and sign lighting, should have 2-foot candles and the residential section $\frac{1}{2}$-foot candle. If lights are placed 10 feet above the sidewalks, calculate the number and power of lamps necessary on each pole (1) in the business section, (2) in the residential section.

4. Discuss the following topics:

a. Floodlighting—for playing baseball at night, lighting the outside of buildings and monuments, lighting parks, etc.

NOTE.—The Wrigley field in Los Angeles has 144 flood lights, giving an illumination of 40,000,000 candle power.

b. Different kinds of lighting devices.

c. The effect of the color of walls, ceiling, shades, etc., on illumination.

d. Direct, indirect, and semi-direct lighting.

CURRICULUM TEST VII GRADE VIII

DIRECTIONS: You will be allowed 25 minutes to work the problems below. Work rapidly, but try to have every problem correct. Begin to work when your teacher says, "Start."

Number Correct	.....
Ratine.....	.....

Find your rating and continue your PROGRESS CHART.

1. How much do 250 cards cost at $1.00 a hundred? **Answer**.....
2. At 3 for 25¢, how many oranges can you buy for 75¢? **Answer**.....
3. What is 200% of 65? **Answer**.....
4. At 2¢ on a dollar what is the tax rate on $100? **Answer**.....
5. Which is least, $\frac{1}{4}$, .375, or .086? **Answer**.....
6. If the tax rate is $7.00 a hundred, what is the rate on a dollar? **Answer**.....
7. What is the radius of a circle whose diameter is $2\frac{1}{2}$ inches? **Answer**.....
8. Find the cost of one card at 75¢ a hundred. **Answer**.....
9. Find the circumference of a 14-foot circle. **Answer**.....
10. Find the volume of a solid whose dimensions are 4.5′ x 6′ x 7.2′. **Answer**.....
11. Mr. Winton owns a house and lot assessed at a valuation of $9,200. His taxes on this property are $138. What is the rate at which the property is taxed? **Answer**.....
12. Write the formula for the area of a parallelogram. **Answer**.....
13. A retail grocer paid a bill of $600, after deducting discounts of 10% and 2%. What was the amount the grocer paid? **Answer**.....

14. A 90-day note for \$800 was discounted at 6%. Find the proceeds. **14. Answer**.....

15. How many edges has a cube? **15. Answer**.....

16. A manufacturer of cloth imports 5,000 pounds of Australian wool and pays \$4.80 a pound. What import duty must he pay at 25% ad valorem? **16. Answer**.....

17. Find the simple interest on \$450 from April 2 to July 1 at 6%. **17. Answer**.....

18. Find the cost of ten \$1,000 bonds at $99\frac{5}{8}$, including the brokerage fee of \$1.50 a thousand dollars. **18. Answer**.....

19. When Liberty bonds were selling at 89, I purchased seven \$1,000 bonds which pay $4\frac{1}{4}$% interest. What is my annual income from them? **19. Answer**.....

20. Find the compound interest on \$400 for two years at 5%, interest compounded semi-annually. **20. Answer**.....

STANDARDS

Rating.....	1	2	3	4	5	6	7	8
Number Correct.....	0-4	5-6	7-9	10-11	12-14	15-16	17-18	19-20

SECTION VIII

Preliminary to a study of the metric system, it is wise to review the decimal system, because the decimal system forms a foundation for the metric system. Read pages 25 to 31 in MANUAL TO ACCOMPANY MATHEMATICS FOR EVERYDAY USE, Book One.

The following are suggested topics to discuss:

1. Why we study the metric system.

a. Universality of use; foreign trade.

b. Used in scientific writings and investigations.

c. Much simpler than the English system. Why?

d. Used in the Olympic Games.

2. History of the metric system (see textbook, page 238).

3. A comparison of English and metric measure:

a. Compare measurements made with a metric ruler (see centimeter ruler on the protractor supplied with the textbook) with measurements made with a ruler marked in inches, feet, etc.

b. Discover 1 meter = 39.37 inches approximately.

4. Make a graph to show that the metric system is a decimal system. (For data, see page 239.)

5. Note uses of the metric system in industry in Canada, e.g., dimensions of camera, radio, wave length; foreign exchange; foreign markets.

6. Give practice changing from one unit in the metric system to another unit in the same system. The following table will help you:

Unit	Common	Square	Cube
km.	3	6	9
hm.	2	4	6
Dm.	1	2	3
m.	0	0	0
dm.	1	2	3
cm.	2	4	6
mm.	3	6	9

A — Right

Left — *B*

a. To change from any unit in *A* to any unit in *B*, add the digits opposite the stated units in the required column and move the decimal point to the right a number of places equal to the sum.

1.463 hectometers = 14630. centimeters.

b. To change from any unit in *B* to any unit in *A*, follow the same procedure but move the decimal point to the left. Why?

3645.3 decimeters = .36453 kilometers

c. To change from any unit in *A* to another unit in *A*, or from one in *B* to another in *B*, find the required digits opposite the stated units in the required columns and subtract the smaller from the larger, then move the decimal point a number of places equal to the difference in the direction indicated by the arrows.

74.635 kilometers = 7463.5 decameters

For the meter, you may substitute the liter or gram. Of course you will not use the square or cube columns.

Supplementary Problems.

1. In the Olympic Games the runs are measured in meters and kilometers.

a. Compare the length of the 100-yard dash with the 100-meter dash (see page 258).

(*Ans.* 100 yd. = 91.44 meters. 100 meters = 109.36 yd.)

b. In 1928, Percy Williams, of Vancouver, ran the 100 meters in $10\frac{3}{5}$ seconds. At the same speed calculate his time for the 100-yard dash. (*Ans.* 9.6 sec.)

c. Other runs are the 200 meter, the 400 meter, the 800 meter, 1,500 meters, 5,000 meters, 10,000 meters, 1,600 meter relay. Find these distances in English measures.

(*Ans.* 218,72; 437.44; 874.88; 1,640.40; 5,468; 10,936; 1,749.76 yd.)

d. In 1928, the United States relay team won the 1,600 meter relay race in the time of 3.14 and $\frac{1}{5}$. Find the average time for each of the four men.

(*Ans.* 78 and $\frac{11}{20}$ sec.)

2. In 1934, 18,069,252 short tons of freight passed through Canadian canals. Find this weight in (*a*) long tons, (*b*) metric tons. (1 long ton = 2,240 pounds. 1 metric ton = 2,204.6 pounds.)

(*Ans.* 16,133,403$\frac{4}{7}$; 16,392,317.8)

3. Mr. Jones, on a tour in France needed some gasoline. He purchased 50 liters. How many gallons did he buy? (1 gallon = 4.543 liters.) (*Ans.* 11.006 gal.)

4. An English importer purchased sugar in France at the equivalent of 10 cents a kilogram. How much per pound was that in Canadian money? How many

kilograms of sugar are there in a 100-lb. bag? (1 kilogram = about 2.2 pounds.) (*Ans.* $4\frac{6}{11}\phi$; $45\frac{5}{11}$ kgm.)

5. The gasoline tank on my car holds 11 gallons. How many liters of gasoline will be required to fill it? (*Ans.* 49.973 liters)

6. A pile of stone is 4 feet high, 10 feet long, and 6 feet wide. How many steres of stone does it contain? (1 cord = 128 cubic feet. 1 cord = $3\frac{7}{10}$ steres.) (*Ans.* $7\frac{9}{16}$ steres)

7. The "Queen Mary," British superliner, is 1,018 feet long. The German Zeppelin, LZ-129, known as the "Von Hindenburg," is 813 feet long. Express these lengths in meters; in decimeters. (*Ans.* 310.28 meters; 247.80 meters)

8. The average speed of the "Queen Mary" is 40 miles per hour; that of the "Von Hindenberg" is 80 miles per hour. Compare these speeds in kilometers per hour. (1 kilometer = $\frac{5}{8}$ mile.) (*Ans.* 64 kilometers; 128 kilometers)

9. Mr. Williams owns a quarter section of land. How many ares does he own? (1 are = .0247 of an acre.) (*Ans.* 6,477.7 ares)

10. In the Olympic Games the following distances were made: running high jump, 6 ft. 6 in.; running broad jump, 25 ft. $4\frac{3}{4}$ in.; pole vault, 13 ft. $9\frac{1}{2}$ in.; 16 lb. shot-put, 52 ft. $\frac{3}{4}$ in.; 16 lb. hammer-throw, 179 ft. $8\frac{2}{5}$ in.; javelin throw 218 ft. $6\frac{1}{4}$ in. Express each of these distances in meters as a two-place decimal. (1.24 meters means 1 meter, 2 decimeters, and 4 centimeters. (*Ans.* 1.98; 8.82; 6.47; 16.03; 56.69; 68.03 meters)

Pages 243 and 244.

Review pages 164 to 166 in MATHEMATICS FOR EVERYDAY USE, Book One.

Stress the point that the ratio of two quantities of the same kind is the quotient of their numerical measures in terms of a common unit. That is, in any circle $\frac{\text{circumference}}{\text{diameter}} = 3.1416$. π is a letter of the Greek alphabet and corresponds to the English letter "P." It is the first letter of the Greek word which means "circumference," and was originally used to represent the boundary of a circle. Since 1607, it has been used to represent the above mentioned ratio.

Page 250.

Exercise 8.

See pages 75 to 78, MANUAL TO ACCOMPANY MATHEMATICS FOR EVERYDAY USE, Book One.

CURRICULUM TEST VIII GRADE VIII

DIRECTIONS: You will be allowed 25 minutes to work the problems below. Work rapidly, but try to have every problem correct. Begin to work when your teacher says, "Start."

Number Correct	.....
Rating.....	.....

Find your rating and continue your PROGRESS CHART.

1. At 20¢ a hundred, how much do 50 marbles cost? **1. Answer**.....
2. A certain number divided by 5 equals 16. What is the number? **2. Answer**.....
3. How many lateral faces has a pyramid whose base is a square? **3. Answer**.....

4. Ten per cent of what number is 15? 4. Answer.....

5. Find the yearly income from 10 shares of stock, par value $100, annual dividend 6%. 5. Answer.....

6. Which is most, .06, 8%, or .1? 6. Answer.....

7. What fraction of a gallon is a pint? 7. Answer.....

8. How many times as much as 3 inches is 3 feet? 8. Answer.....

9. Mr. Carter makes an automobile trip of 1,680 miles. If the average mileage is 16 miles to the gallon, how much gasoline tax does Mr. Carter pay at the rate of 3¢ a gallon? 9. Answer.....

10. How much are the taxes on a home assessed at $4,500 if the rate of taxation is $2.40 a hundred dollars? 10. Answer.....

11. If $\frac{3}{4}$ pound of meat costs 30¢, what is the price a pound? 11. Answer.....

12. Write the formula for the volume of a rectangular solid. 12. Answer.....

13. What is the perimeter of a $2\frac{1}{2}$-foot square? 13. Answer.....

14. The yearly premium on a $7,000 endowment policy is $321.23. Find the yearly premium on a thousand dollars. 14. Answer.....

15. If the taxes on a home assessed at $5,000 amount to $200, what is the rate of taxation on a dollar?

15. Answer.....

16. Find the duty on a 10′ by 12′ rug, valued at a $1.40 a square foot, if the duty is 30%.

16. Answer.....

17. Find the interest on $420 at 6% from July 1 to September 1.

17. Answer.....

18. What is the area of a $\frac{1}{2}$-inch square?

18. Answer.....

19. A man insured his $8,000 house for $\frac{3}{4}$ of its value at 28¢ a hundred. A few months later there was a fire which resulted in damage amounting to $3,000. How much more did the man receive than he had paid as a premium?

19. Answer.....

20. What is the area of the entire surface of a 4-inch cube?

20. Answer.....

STANDARDS

Rating.....	1	2	3	4	5	6	7	8
Number Correct.....	0–5	6–8	9–10	11–13	14–16	17–18	19	20

CURRICULUM TEST IX GRADE VIII

DIRECTIONS: You will be allowed 25 minutes to work the problems below. Work rapidly, but try to have every problem correct. Begin to work when your teacher says, "Start."

Number Correct	.....
Rating.....	.....

Find your rating and continue your PROGRESS CHART.

1. If a number multiplied by 4 equals 20, what is the number? **1. Answer**.....
2. How much do 15 apples cost at 3 for 8¢? **2. Answer**.....
3. At 20¢ a half pint, what does a quart of cream cost? **3. Answer**.....
4. How many inches are there in 3 feet 7 inches? **4. Answer**.....
5. Six is what per cent of 100? **5. Answer**.....
6. Write the formula for the circumference of a circle. **6. Answer**.....
7. Find the average weight of 5 fish that weighed in all 4 pounds. **7. Answer**.....
8. What is the yearly income from six $1,000 bonds if the rate if interest is $4\frac{1}{2}\%$? **8. Answer**.....
9. How many degrees is it from 15° below zero to 40° above zero? **9. Answer**.....
10. A house valued at $4,800 was insured for $\frac{5}{6}$ of its value at $1\frac{3}{4}\%$. How much premium was paid? **10. Answer**.....

11. What fraction of a cubic yard is a cubic foot? 11. Answer.....

12. At what temperature does water begin to freeze? 12. Answer.....

13. The actual valuation of a house is \$8,250. The assessed valuation is $\frac{2}{3}$ of the actual valuation. If the taxes paid on the house are \$165, what is the rate of taxation? 13. Answer.....

14. The list price of a hat was \$8.00. What was the net price, if the discount was 15% and 5%. 14. Answer.....

15. Which is most, $\frac{7}{10}$, $\frac{11}{15}$, or $\frac{3}{5}$? 15. Answer.....

16. How much must be saved a month to pay the yearly premium on a \$4,000 life-insurance policy if the premium is \$12.96 a thousand? 16. Answer.....

17. If a meter equals 39.37 inches, how long in inches is a centimeter? 17. Answer.....

18. What per cent of a mixture of 14 quarts of water and 2 quarts alcohol is alcohol? 18. Answer.....

19. What is the amount of a 60-day note for \$700 at 8% interest? 19. Answer.....

20. The basement for a house is 24 feet 6 inches wide, 28 feet 4 inches long, and 6 feet deep. The contractor figures the cost

of excavation at 54¢ a cubic yard. At this rate what will be the cost? **20. Answer**.....

STANDARDS

Rating.....	1	2	3	4	5	6	7	8
Number Correct.....	0–6	7–8	9–11	12–13	14–15	16–17	18–19	20

CURRICULUM TEST X GRADE VIII

DIRECTIONS: You will be allowed 25 minutes to work the problems below. Work rapidly, but try to have every problem correct. Begin to work when your teacher says, "Start."

Number Correct .....

Rating..... .....

Find your rating and continue your PROGRESS CHART.

1. You agree to pay 40 per cent of the expenses of an automobile trip and they amount to $64. How much do you pay? **1. Answer**.....
2. How many shirt-waist lengths of $2\frac{1}{2}$ yards each can be cut from 20 yards of cloth? **2. Answer**.....
3. Find x, if $x + 5 = 9$. **3. Answer**.....
4. A $100 share of stock sold for $90 is sold below, at, or above par? **4. Answer**.....
5. Which is most, a meter, a decimeter, or a centimeter? **5. Answer**.....
6. How much will it cost to cover a surface 3 feet by 9 feet with

blackboard at 25¢ a square foot? **6. Answer**.....

7. John is thinking of a number. If he subtracts 8 from it, he gets 28. Write this as an equation and find the number. **7. Answer**.....

8. Is the expression $2x = 8$ an equation, a formula, or a proportion? **8. Answer**.....

9. Solve the expression in (8) for x. **9. Answer**.....

10. The tax rate in our city in a recent year was \$.062 on a dollar. If Mr. A's property was valued at \$8,500 and was assessed at 50% of its value, how much were his taxes? **10. Answer**.....

11. What is the premium on a \$2,000 policy at \$14.36 a thousand? **11. Answer**.....

12. What is the perimeter of a 10-foot square? **12. Answer**.....

13. What kind of import duty is a duty that is a per cent of the value of the article? **13. Answer**.....

14. Write the formula for the circumference of a circle. **14. Answer**.....

15. A dealer buys 75 sewing machines at \$38 each. He pays \$56.25 freight on the machines and sells them at \$45 each. His overhead charges are \$1.20 a machine. Find his profit. **15. Answer**.....

16. The four faces of a church spire are triangles. The base of each triangle is 18 feet and the altitude 54 feet. How many square feet of roofing are required for the spire?

16. Answer.....

17. At $.30 a yard, how much will it cost to build a fence around a garden 40 feet long and 26 feet wide?

17. Answer.....

18. A merchant buys goods listed at $2,400. If he pays cash, he received a discount of 10%. How much will he save if he borrows the money for 90 days at 6% and pays cash?

18. Answer.....

19. Express in Arabic numerals: MCCXIX.

19. Answer.....

20. What is the formula for the volume of a cylinder?

20. Answer.....

STANDARDS

Rating.....	1	2	3	4	5	6	7	8
Number Correct.....	0–4	5–7	8–10	11–12	13–14	15–17	18	19–20

MATHEMATICS for EVERYDAY USE

BOOK TWO

ANSWERS

THE JOHN C. WINSTON CO., LIMITED
TORONTO

BOOK TWO

SECTION I

Page 1.—**1.** 268; 7; 8. **2.** 161.9; 87.1. **3.** 6 hr. 45 min.; 3 hr. 5 min. **4.** 3 hr.; 6 hr. 23 min. **5.** 29.03 mi. **6.** 52¢. **7.** $5.59. **8.** $.90; $1.24.

Page 2.—**9.** $6.25. **10.** $21.40.

Page 3.—Addition: **1.** 3,747. **2.** 3,901. **3.** 3,692. **4.** 4,071. **5.** 2,436. **6.** 4,461.

Subtraction: **1.** 4,885. **2.** 5,034. **3.** 4,855. **4.** 7,476. **5.** 3,025. **6.** 7,688. **7.** 5,977. **8.** 6,563. **9.** 3,443. **10.** 2,665. **11.** 2,621. **12.** 2,777.

Multiplication: **1.** 29,230. **2.** 7,532. **3.** 16,647. **4.** 41,160. **5.** 293,568. **6.** 18,265. **7.** 12,054. **8.** 10,452. **9.** 12,596. **10.** 177,424. **11.** 478,676. **12.** 165,006.

Division: **1.** 357. **2.** 319. **3.** 731. **4.** 941. **5.** 385. **6.** 274. **7.** 508. **8.** 956.

Page 4.—**1.** 2, 3, 5, 4, 5; no. **2.** 8, 10, 11, 11, 12; no. **3.** At the intersection of lines 5 and 7.

Page 5.—Frequency Graphs or Histograms: **1.** 8; 7; 0. **2.** 41.

Page 6.-3.

Number Correct	Frequency
12	4
11	3
10	2
9	4
8	4
7	3
6	4
5	3
4	1
3	0
2	0
1	0
0	0

4. $8\frac{9}{28}$, or 8.32.
6. 10; 6; 8.
7. Graph.
9. Age 10, 1; age 11, 3; age 12, 7; age 13, 6; age 14, 4; age 15, 2; age 16, 1.

Page 7.—Addition: **1.** 4,231. **2.** 3,516. **3.** 3,862. **4.** 3,974. **5.** 2,613. **6.** 5,017.

Subtraction: **1.** 50,806. **2.** 51,469. **3.** 68,991. **4.** 58,278. **5.** 37,946. **6.** 77,636. **7.** 69,349. **8.** 79,947.

Multiplication: **1.** 415,658. **2.** 350,517. **3.** 204,672. **4.** 370,562. **5.** 431,290. **6.** 3,357,343. **7.** 510,640.

Division: **1.** 527. **2.** 5,030 (68 rem.). **3.** 649. **4.** 428. **5.** 536. **6.** 819.

Page 8.—Addition: **1.** $\frac{2}{5}$. **2.** 1. **3.** 5. **4.** 7. **5.** $\frac{7}{10}$. **6.** $8\frac{9}{10}$. **7.** $6\frac{3}{4}$. **8.** $9\frac{1}{2}$. **9.** $5\frac{3}{4}$. **10.** $1\frac{3}{5}$. **11.** $1\frac{11}{24}$. **12.** $9\frac{1}{2}$.

Subtraction: **1.** $\frac{1}{2}$. **2.** $2\frac{1}{4}$. **3.** $7\frac{2}{3}$. **4.** $6\frac{1}{2}$. **5.** $6\frac{2}{3}$. **6.** $4\frac{5}{8}$. **7.** $4\frac{4}{9}$. **8.** $\frac{1}{2}$. **9.** 4. **10.** $4\frac{1}{4}$. **11.** $6\frac{1}{2}$. **12.** $3\frac{33}{40}$.

Multiplication: **1.** 2. **2.** $\frac{1}{4}$. **3.** $4\frac{1}{4}$. **4.** $\frac{8}{9}$. **5.** $\frac{2}{3}$. **6.** $12\frac{2}{3}$. **7.** $\frac{1}{2}$. **8.** $10\frac{2}{3}$. **9.** $12\frac{2}{3}$. **10.** $\frac{2}{5}$. **11.** $2\frac{3}{8}$. **12.** $11\frac{2}{3}$.

Division: **1.** 1. **2.** $\frac{33}{40}$. **3.** $2\frac{2}{7}$. **4.** $\frac{4}{5}$. **5.** $\frac{9}{40}$. **6.** $2\frac{2}{9}$. **7.** 16. **8.** $\frac{5}{8}$. **9.** $1\frac{1}{2}$. **10.** $\frac{2}{3}$. **11.** $1\frac{19}{21}$. **12.** $\frac{1}{3}$.

Page 9.—**1.** *a*, $\frac{1}{5}$; *b*, $\frac{2}{7}$; *c*, $\frac{1}{4}$; *d*, $\frac{4}{5}$; *e*, $\frac{1}{2}$; *f*, $\frac{3}{8}$. **2.** *a*, $\frac{2}{6}$, $\frac{3}{9}$, $\frac{5}{15}$, $\frac{4}{12}$, $\frac{9}{27}$; *b*, $\frac{24}{48}$; *c*, $\frac{14}{16}$; *d*, $\frac{16}{26}$; *e*, $\frac{8}{12}$; *f*, $\frac{15}{20}$. **3.** *a*, $1\frac{1}{3}$; *b*, $1\frac{1}{2}$; *c*, 3; *d*, $1\frac{7}{12}$; *e*, $2\frac{1}{3}$. **4.** *a*, $\frac{4}{5}$; *b*, $\frac{2}{3}$; *c*, $\frac{23}{3}$; *d*, $\frac{28}{5}$; *e*, $\frac{51}{8}$; *f*, $\frac{73}{10}$. **5.** *b*, $\frac{5}{8}$, $\frac{2}{8}$; *c*, $\frac{10}{15}$, $\frac{9}{15}$; *d*, $\frac{3}{24}$, $\frac{20}{24}$; *e*, $\frac{8}{12}$, $\frac{9}{12}$; *f*, $\frac{7}{12}$, $\frac{3}{12}$. **6.** $\frac{6}{24}$, $\frac{4}{24}$, $\frac{3}{24}$. **7.** $\frac{16}{24}$, $\frac{18}{24}$, $\frac{15}{24}$. **8.** *a*, $4\frac{5}{4}$; *b*, $1\frac{3}{8}$; *c*, $5\frac{5}{8}$; *d*, $6\frac{10}{8}$; *e*, $3\frac{4}{4}$; *f*, $8\frac{39}{24}$; *g*, $8\frac{6}{24}$; *h*, $6\frac{33}{8}$. **9.** *a*, $8\frac{1}{5}$; *b*, 9; *c*, $16\frac{1}{2}$; *d*, 11. **10.** *a*, $\frac{1}{4}$; *b*, $\frac{1}{2}$; *c*, $\frac{3}{4}$; *d*, $\frac{1}{8}$; *e*, $\frac{3}{8}$; *f*, $\frac{5}{8}$; *g*, $\frac{7}{8}$; *h*, $\frac{1}{3}$; *i*, $\frac{2}{3}$; *j*, $\frac{1}{5}$; *k*, $\frac{2}{5}$; *l*, $\frac{3}{5}$; *m*, $\frac{4}{5}$; *n*, $\frac{6}{8}$; *o*, $\frac{1}{6}$.

Page 10.—**1.** $1.50. **2.** $1.80. **3.** $.42. **4.** $1.08. **5.** $.81.

Page 11.—**6.** Grace. **7.** $2.40. **8.** $1.10. **9.** $.60. **10.** $.60. **11.** $.20. **12.** $\frac{1}{4}$. **13.** 4 lb. **14.** $.37; $1.48; $7.40; $.30. **15.** $.40. **16.** $.49; $.70; $.84; $.91; $.94$\frac{1}{2}$ or $.95. **17.** $2.10; $2.45. **18.** $30.

Page 12.—**Set I:** **1.** *a*, $\frac{2}{5}$; *b*, $\frac{3}{4}$; *c*, 1; *d*, $1\frac{2}{5}$; *e*, $1\frac{1}{2}$. **2.** *a*, $6\frac{1}{4}$; *b*, $7\frac{2}{3}$; *c*, $6\frac{3}{4}$; *d*, $13\frac{1}{8}$; *e*, $6\frac{1}{2}$. **3.** *a*, $4\frac{3}{5}$; *b*, $3\frac{1}{3}$; *c*, 12; *d*, $10\frac{1}{3}$; *e*, $18\frac{2}{3}$.

Set II: **1.** *a*, $\frac{3}{4}$; *b*, $1\frac{1}{6}$; *c*, $1\frac{1}{2}$; *d*, $\frac{1}{2}$; *e*, $1\frac{1}{3}$. **2.** *a*, $3\frac{5}{6}$; *b*, $9\frac{5}{6}$; *c*, 8; *d*, $15\frac{1}{4}$; *e*, $11\frac{1}{2}$. **3.** *a*, $\frac{11}{12}$; *b*, $\frac{19}{30}$; *c*, $1\frac{7}{40}$; *d*, $1\frac{17}{20}$; *e*, $2\frac{1}{6}$.

Set III: **1.** *a*, $5\frac{9}{20}$; *b*, $19\frac{14}{15}$; *c*, 2; *d*, $14\frac{5}{12}$; *e*, $14\frac{1}{10}$. **2.** *a*, $5\frac{11}{12}$; *b*, $2\frac{3}{4}$; *c*, 5; *d*, $2\frac{1}{15}$; *e*, $18\frac{1}{4}$.

Page 13.—**1.** 17; $24\frac{1}{2}$; 24; 28; 28; $11\frac{1}{4}$. **2.** $132\frac{3}{4}$ hr. **3.** $23\frac{3}{4}$; 32; 26; $22\frac{3}{4}$; $28\frac{1}{4}$. **4.** $132\frac{3}{4}$ hr.

6–8.

	Mon.	Tues.	Wed.	Thu.	Fri.	Sat.	Total
Dick	1.68	2.04	3.24	2.04	2.40	0	11.40
Fred	1.92	2.64	3.48	3.84	2.28	1.20	15.36
Keith	.72	2.88	.24	3.24	3.96	1.44	12.48
John	1.32	.36	3.00	2.40	2.04	1.80	10.92
Carl	2.52	3.84	1.56	1.92	2.76	.96	13.56
Total	8.16	11.76	11.52	13.44	13.44	5.40	63.72

Page 14.—**Set I:** **1.** *a*, $\frac{1}{5}$; *b*, $\frac{1}{2}$; *c*, 0; *d*, $4\frac{1}{3}$; *e*, 7. **2.** *a*, $7\frac{2}{3}$; *b*, $4\frac{1}{2}$; *c*, $\frac{2}{5}$; *d*, $3\frac{2}{5}$; *e*, $5\frac{1}{2}$. **3.** *a*, 2; *b*, $8\frac{3}{4}$; *c*, $\frac{4}{5}$; *d*, $3\frac{1}{3}$; *e*, $\frac{1}{2}$.

Set II: **1.** *a*, $6\frac{2}{3}$; *b*, $6\frac{3}{4}$; *c*, $10\frac{4}{5}$; *d*, $\frac{2}{3}$; *e*, $6\frac{1}{2}$. **2.** *a*, $\frac{1}{4}$; *b*, $\frac{1}{3}$; *c*, $3\frac{1}{4}$; *d*, $\frac{3}{8}$; *e*, $9\frac{1}{4}$. **3.** *a*, $8\frac{1}{2}$; *b*, $6\frac{1}{2}$; *c*, $6\frac{11}{12}$; *d*, $7\frac{1}{3}$; *e*, $\frac{7}{8}$.

Set III: **1.** *a*, $\frac{1}{12}$; *b*, $\frac{11}{24}$; *c*, $\frac{4}{24}$; *d*, $9\frac{11}{24}$; *e*, $\frac{19}{24}$. **2.** *a*, $8\frac{9}{40}$; *b*, $6\frac{17}{24}$; *c*, $6\frac{1}{12}$; *d*, $5\frac{5}{8}$; *e*, $8\frac{19}{24}$. **3.** *a*, $5\frac{13}{24}$; *b*, $5\frac{5}{12}$; *c*, $3\frac{7}{12}$; *d*, $8\frac{8}{15}$; *e*, $\frac{13}{20}$.

Page 15.—**1.** $\frac{3}{4}$ cup. **2.** 3 cups. **3.** 6 cups sugar; $\frac{3}{4}$ cup water, $2\frac{1}{4}$ cups milk, $1\frac{1}{2}$ tablespoonfuls butter, 3 squares chocolate; 1 cup sugar, $\frac{1}{8}$ cup water, $\frac{3}{8}$ cup milk, $\frac{1}{4}$ tablespoonful butter, $\frac{1}{2}$ square chocolate.

Page 16.—**4.** $3\frac{1}{2}$ cups; $\frac{7}{12}$ cup. **5.** 1 cup; $1\frac{1}{4}$ cups; 72 pancakes. **6.** $\frac{3}{4}$ cup; $2\frac{1}{4}$ cups; 3 cups. **7.** $\frac{1}{3}$ cup butter, $\frac{7}{8}$ cup sugar; $\frac{4}{3}$ cup b., Can. B.

$3\frac{1}{2}$ cups s.; $\frac{8}{9}$ cup b., $2\frac{1}{3}$ cups s. **8.** 1.7 lb. salt, 2.95 lb. lard; .85 lb. sugar, 1.475 lb. lard; 27.2 lb. sugar, 47.2 lb. lard. **9.** $13\frac{1}{2}$ lb.; 20 loaves.

Page 17.—Set I: 1. *a*, 2; *b*, $\frac{3}{8}$; *c*, $\frac{1}{12}$. **2.** *a*, $\frac{1}{3}$; *b*, 1; *c*, $\frac{2}{5}$. **3.** *a*, $\frac{4}{5}$; *b*, 3; *c*, $\frac{5}{36}$. **4.** *a*, $12\frac{3}{4}$; *b*, $2\frac{3}{5}$; *c*, $\frac{7}{20}$. **5.** *a*, $11\frac{1}{4}$; *b*, $1\frac{1}{3}$; *c*, $\frac{1}{5}$.

Set II: 1. *a*, 21; *b*, 9; *c*, $\frac{5}{6}$. **2.** *a*, $31\frac{2}{3}$; *b*, $8\frac{2}{3}$; *c*, $\frac{5}{12}$. **3.** *a*, $47\frac{1}{2}$; *b*, $42\frac{3}{4}$; *c*, $3\frac{17}{20}$. **4.** *a*, $18\frac{9}{10}$; *b*, $77\frac{1}{3}$; *c*, $2\frac{17}{20}$. **5.** *a*, 66; *b*, $10\frac{5}{6}$; *c*, $2\frac{11}{12}$.

Set III: 1. *a*, $\frac{1}{27}$; *b*, $5\frac{5}{6}$; *c*, 165. **2.** *a*, $\frac{5}{6}$; *b*, 30; *c*, $631\frac{5}{6}$. **3.** *a*, 4; *b*, 25; *c*, 588. **4.** *a*, $2\frac{28}{33}$; *b*, $8\frac{2}{3}$; *c*, $2{,}849\frac{1}{5}$. **5.** *a*, 12; *b*, $60\frac{15}{56}$; *c*, $546\frac{1}{3}$.

Page 18.—1. 66 qt. **2.** $53\frac{1}{3}$ qt. 3. Arthur; $12\frac{2}{3}$ qt. **4.** $2\frac{1}{4}$*¢*. **5.** $\$23.01\frac{3}{4}$; $\$1.48\frac{1}{2}$. **6.** $1.20. **7.** 80 qt. **8.** $63\frac{15}{16}$ crates; 45 crates. **9.** $54.99. **10.** $8.00. **11.** $1.50.

Page 19.—Set I: *a*, 32; *b*, $9\frac{1}{3}$; *c*, 25; *d*, $13\frac{1}{2}$; *e*, $5\frac{1}{2}$. **2.** *a*, $\frac{3}{4}$; *b*, $\frac{1}{2}$; *c*, 1; *d*, $2\frac{2}{5}$; *e*, $2\frac{2}{5}$. **3.** *a*, $2\frac{2}{5}$; *b*, 4; *c*, $17\frac{6}{7}$; *d*, $5\frac{1}{2}$; *e*, 10.

Set II: 1. *a*, $\frac{1}{12}$; *b*, $\frac{3}{20}$; *c*, $\frac{1}{6}$; *d*, $\frac{4}{27}$; *e*, $\frac{1}{2}$. **2.** *a*, $\frac{3}{14}$; *b*, $\frac{11}{20}$; *c*, $1\frac{6}{18}$; *d*, $4\frac{2}{5}$; *e*, $\frac{1}{2}$. **3.** *a*, $\frac{3}{20}$; *b*, $\frac{1}{6}$; *c*, $\frac{5}{28}$; *d*, $\frac{1}{10}$; *e*, $\frac{1}{4}$.

Set III: 1. *a*, $\frac{42}{43}$; *b*, $\frac{16}{28}$; *c*, 6; *d*, $2\frac{2}{11}$; *e*, $6\frac{1}{4}$. **2.** *a*, $\frac{8}{15}$; *b*, $\frac{1}{4}$; *c*, 1; *d*, $3\frac{29}{45}$; *e*, 3. **3.** *a*, $69\frac{1}{16}$; *b*, $51\frac{3}{14}$; *c*, $1\frac{15}{30}$; *d*, $\frac{5}{12}$; *e*, 2.

Page 20.—1. Less for 6 crops; greater for 3 crops. **2.** Wheat, 1.3; oats, 2.5; barley, 3.7; rye, 4.5; corn, 10.4. **3.** Hay and clover, .04; alfalfa, .25; beets, .6. **4.** $4.74. **5.** Greatest for hay and clover, alfalfa, and sugar beets; lowest for the rest.

Page 21.—Addition: **1.** .8. **2.** 2.5. **3.** .13. **4.** 9.31. **5.** .77. **6.** 1.7. **7.** .07. **8.** 2.643. **9.** 19.005. **10.** 27.71. **11.** 18.935. **12.** 30.264.

Subtraction: **1.** .5. **2.** 0. **3.** .12. **4.** .15. **5.** .105. **6.** .47. **7.** .425. **8.** .03. **9.** .048. **10.** .898. **11.** 1.3. **12.** 4.9. **13.** 31.47. **14.** 2.05. **15.** 15.725. **16.** 13.28. **17.** .14. **18.** .495. **19.** 1.352. **20.** .052. **21.** 15.05. **22.** .56.

Multiplication: **1.** .6. **2.** .09. **3.** .008. **4.** 2.8. **5.** .48. **6.** .054. **7.** 4. **8.** .3. **9.** .03. **10.** 51.3. **11.** 36. **12.** 39.48. **13.** 19.706.

Page 22.—14. 51. **15.** 27. **16.** 39.2. **17.** 168. **18.** .09. **19.** 4,820. **20.** .6. **21.** 17.28. **22.** 47.6. **23.** 9.176. **24.** 4.2024. **25.** 762. **26.** .028. **27.** .0436.

Division: **1.** 1.9. **2.** 1.96. **3.** 2.141. **4.** 2. **5.** .12. **6.** .284. **7.** .02. **8.** .006. **9.** .05. **10.** .5. **11.** .75. **12.** .08. **13.** 2.88. **14.** 2.727. **15.** .415. **16.** 27. **17.** 25.9. **18.** 6. **19.** 30. **20.** 50. **21.** 7.5. **22.** 5.555. **23.** 12. **24.** 15.4. **25.** 30. **26.** 50. **27.** 75. **28.** 3. **29.** 1.1. **30.** 110. **31.** By 10: *a*, .375; *b*, 1.82; *c*, 6.5; *d*, 2.875; *e*, 1.07. By 100: *a*, .0375; *b*, .182; *c*, .65; *d*, .2875; *e*, .107.

Page 23.—1. 44,225+. **3.** 20 members. 4. Alberta, 16; B.C., 15; Manitoba, 15. **5.** $\frac{13}{49}$; .265+.

Page 24.—1. $4,873,646.21. **2.** 11.78 ft. **3.** 46.64 ft. **4.** 3.46 mi. **5.** 5.8 ft. **6.** $\frac{23}{88}$ mi.

Page 25.—Changing the Form of Fractions: **1.** *a*, $\frac{7}{16}$; *b*, $\frac{37}{40}$; *c*, $\frac{3}{50}$; *d*, $\frac{1}{8}$; *e*, $\frac{1}{4}$; *f*, $\frac{1}{3}$. **2.** *a*, .5; *b*, .25; *c*, .4; *d*, .875; *e*, $.66\frac{2}{3}$; *f*, $.55\frac{5}{9}$; *g*, $.91\frac{2}{3}$; *h*, $.63\frac{1}{3}$.

Practice Exercise, Addition: **1.** .9. **2.** 1.7. **3.** .24. **4.** 5.47. **5.** .85. **6.** 54.43. **7.** .08. **8.** 6.709. **9.** 14.115. **10.** 28.99.

Subtraction: **1.** 4. **2.** 0. **3.** .14. **4.** .21. **5.** .307. **6.** .53. **7.** .225. **8.** .02. **9.** .047. **10.** .794. **11.** 3.5. **12.** 10.9. **13.** 42.77. **14.** 2.08. **15.** 12.725. **16.** 22.96. **17.** .57. **18.** .493. **19.** .27. **20.** .043.

Page 26.—**2.** *a*, 6.3; *b*, .168; *c*, 4; *d*, .0072; *e*, .24; *f*, 4.5. **3.** .7. **4.** 3.2. **5.** 2. **6.** 77.4. **7.** 14.268. **8.** 336.2. **9.** .035. **10.** 30.10. **11.** .08. **12.** .48. **13.** .4. **14.** 44. **15.** 24. **16.** 108. **17.** .15. **18.** 17.094. **19.** .009. **20.** .032. **21.** .04. **22.** 14.72. **23.** 16. **24.** .06. **25.** 43.71. **26.** 32.6027. **27.** By 10: .1; 1.5; 37; 964.2; 8.75; 93.75. By 100: 1; 15; 370; 9,642; 87.5; 937.5. By 1,000: 10; 150; 3,700; 96,420; 875; 9,375.

Page 27.—**3.** *a*, 2.41; *b*, .003; *c*, 11; *d*, 16. **4.** 2.4. **5.** 1.75. **6.** 2.341. **7.** .2. **8.** .11. **9.** .162. **10.** .02. **11.** .006. **12.** .05. **13.** .5. **14.** .75. **15.** .05. **16.** 3.2. **17.** 1.364. **18.** .541. **19.** 23. **20.** 36.2. **21.** 5. **22.** 20. **23.** 50. **24.** 7.5. **25.** 5.714. **26.** 13. **27.** 16.9. **28.** 30. **29.** 50. **30.** 75. **31.** 5. **32.** .918. **33.** 216.667. **34.** Multiply by 4, divide by 100; multiply by 2, divide by 100; multiply by 3, divide by 100; multiply by 8, divide by 100; omit last zero or move decimal point 1 place to left; omit 2 zeros or move point 2 places to left; omit 3 zeros or move point 3 places to left; multiply by 5, divide by 100.

Page 28.—**1.** $.08; $\frac{2}{25}$¢; 8¢. **2.** $\frac{2}{3}$ ft.; .66$\frac{2}{3}$ ft.; $\frac{2}{9}$ yd. **3.** .25 mi.; 25% mi.; $\frac{25}{100}$ mi. **4.** 2$\frac{1}{4}$ lb.; 36 oz.; .0225 cwt. **5.** $\frac{3}{4}$ yd.; 27 in.; 2$\frac{1}{4}$ ft. **6.** 5 pt.; 2$\frac{1}{2}$ qt.; $\frac{5}{8}$ gal. **7.** 2$\frac{1}{6}$ yd.; 78 in.; 6$\frac{1}{2}$ ft. **8.** 135 min.; 2$\frac{1}{4}$ hr.; $\frac{3}{32}$ da. **9.** 4$\frac{1}{2}$ pk.; 36 qt.; 72 pt. **11.** 50% of; $\frac{50}{100}$ of; ÷ 2. **12.** $\frac{3}{4}$ of; $\frac{75}{100}$ of; 75% of. **13.** $\frac{1}{2}$ of; $\frac{20}{100}$ of; .20 ×. **14.** 10% of; ÷ 10; .10 ×. **15.** $\frac{1}{2}$ ×; $\frac{50}{100}$ of; .50 ×. **16.** $\frac{2}{5}$ of; 40% of; .40 ×. **17.** $\frac{1}{3}$ of; .33$\frac{1}{3}$ of; ÷ 3. **18.** × .4; × .40; × 40%. **19.** $\frac{5}{2}$ ×; 1.25 ×; 125% of. **20.** 37$\frac{1}{2}$% of; .375 ×; $\frac{75}{100}$ ×. **21.** 25% of; .25 ×; ÷ 4. **22.** 66$\frac{2}{3}$%; .66$\frac{2}{3}$ ×; ÷ $\frac{3}{2}$. **23.** .111. **24.** .285. **25.** .833. **26.** .625. **27.** .562. **28.** .387. **29.** .482. **30.** .341. **31.** .848. **32.** .760. **33.** .111; .285; .341; .387; .482; .562; .625; .76; .833; .848. **34.** 9$\frac{3}{4}$ ft.; 9 ft. 9 in. **35.** 15 lb. **36.** $22.20.

Page 29.—Test I: **1.** 25%. **2.** 125%. **3.** 37$\frac{1}{2}$%. **4.** 6$\frac{1}{4}$%. **5.** 46$\frac{2}{3}$%. **6.** 60%. **7.** 9%. **8.** 352$\frac{1}{2}$%. **9.** 40%. **10.** 250%.

Test II: **1.** .35. **2.** .5. **3.** .274. **4.** .0725. **5.** .08. **6.** 1.2. **7.** .4133. **8.** .0075. **9.** .005. **10.** 2.1525.

Test III: **1.** $\frac{1}{2}$. **2.** $\frac{3}{5}$. **3.** $\frac{1}{8}$. **4.** $\frac{3}{4}$. **5.** $\frac{2}{5}$. **6.** $\frac{2}{3}$. **7.** $\frac{1}{3}$. **8.** $\frac{7}{8}$. **9.** $\frac{1}{4}$. **10.** $\frac{1}{6}$.

Test IV: **1.** $7.50. **2.** $30.24. **3.** $16.38. **4.** 1.6. **5.** 2. **6.** 20. **7.** 40. **8.** 60. **9.** 896.

Test V: **1.** 25%. **2.** 80%. **3.** 44$\frac{4}{9}$%. **4.** 140%. **5.** 125%. **6.** 55$\frac{5}{9}$%. **7.** 2%. **8.** $\frac{1}{3}$%. **9.** 120%.

Test VI: **1.** 200. **2.** $2,000. **3.** 200. **4.** 8. **5.** 800. **6.** 200.

Test VII: **1.** 50%; 33$\frac{1}{3}$%; 25%; 9%; 40%; 225%. **2.** .2; .08; 2.04. **3.** $170. **4.** 300. **5.** 25%.

Page 30.—**1.** Jersey; Holstein-Friesian. **2.** .3 lb. a hundred; 2.2 lb. **3.** 56 lb.; 34 lb.; Ayrshire, 36 lb.; Shorthorn, 44 lb.; Devon, 46 lb.; Guernsey, 53 lb. **4.** 59.36 lb.; 40.32 lb. **5.** $16.31. **6.** $20. **7.** $3.69 more by making butter if skim milk and buttermilk are sold.

Page 31.—**1.** .25; $\frac{1}{4}$; $\frac{25}{100}$. **2.** .2; $\frac{20}{100}$; $\frac{1}{5}$. **3.** $\frac{50}{100}$; .5; $\frac{1}{2}$; $\frac{5}{10}$. **4.** .33$\frac{1}{3}$; $\frac{1}{3}$. **5.** .75; 75%. **6.** 87.5%; .875. **7.** $\frac{3}{8}$; .375; 37.5%. **8.** 33%; 25%; .4%. **9.** 18 in.; 1$\frac{1}{2}$ ft.; 1.5 ft. **10.** 12 oz.; $\frac{3}{4}$ lb.; $\frac{1}{16}$ lb.

Commonly Used Equivalents: **1.** *a*, 30; *b*, 10; *c*, $1.20. **2.** *a*, 2; *b*, 9; *c*, 200. **3.** *a*, 9; *b*, $.60; *c*, 100. **4.** *a*, 3; *b*, 50; *c*, 225.

Page 32.—5. *a*, $26; *b*, $5.20; *c*, $4.50. **6.** *a*, 8; *b*, 18; *c*, 100. **7.** *a*, 1; *b*, 32; *c*, 540. **8.** *a*, 6; *b*, 15; *c*, 300. **9.** *a*, 21; *b*, 30; *c*, 500.
Problems in Percentage: **1.** $1.26. **2.** 40%. **3.** 10%. **4.** 12,840, **5.** 28,472.73 lb. **6.** 10%. **7.** 5½%. **8.** $4.70.

Page 34.—1. *a*, 5%; *b*, 118%; *c*, 65%; *d*, 182.5%; *e*, 40%; *f*, 67½%; *g*, 180%; *h*, 133⅓%; *i*, 2.5%; *j*, 16.4%; *k*, 500%; *l*, 18%. **2.** *a*, .06; *b*, .135; *c*, .17; *d*, .3; *e*, 1.18; *f*, .66⅔; *g*, 1.184; *h*, 1.02; *i*, 1.67½; *j*, 4; *k*, .035; *l*, .042. **3.** *a*, .20; 20%; *b*, .66⅔, 66⅔%; *c*, .90, 90%; *d*, .24, 24%; *e*, .06, 6%; *f*, .62½, 62½%; *g*, .75, 75%; *h*, .16⅔, 16⅔%.
Finding Answers: **1.** *a*, 5.4; *b*, 5.46; *c*, 3.715. **2.** *a*, 140; *b*, 74; *c*, 274. **3.** *a*, 90; *b*, 243; *c*, 466.25. **4.** *a*, 36; *b*, 332; *c*, 163. **5.** *a*, 320; *b*, 181.44; *c*, 423.36. **6.** *a*, 10; *b*, 14.945; *c*, 25.685. **7.** *a*, 60; *b*, 26.52; *c*, 48.608. **1.** *a*, 80; *b*, 1,788; *c*, 4,300. **2.** *a*, 315; *b*, 502.2; *c*, 1,571.13. **3.** *a*, 560; *b*, 769.94; *c*, 1,241. **4.** *a*, 780; *b*, 1,275; *c*, 1,975. **5.** *a*, 1,000; *b*, 880; *c*, 702. **6.** *a*, 1,052; *b*, 883.2; *c*, 2,095.2. **7.** *a*, 4,200; *b*, 2,741.4; *c*, 2,227.5.

Page 35.—1. 25%. **2.** 50%. **3.** 3%. **4.** 3.2%. **5.** 33⅓%. **6.** 25%. **7.** 20%. **8.** 3%. **9.** 18%. **10.** 16⅔%.
1. 200%. **2.** 100%. **3.** 115%. **4.** 104%. **5.** 12½%. **6.** 6⅔%. **7.** 300%. **8.** 100%. **9.** 250%. **10.** 112.5%. **11.** 113⅜%. **12.** 100%.
1. 500. **2.** 800. **3.** 640. **4.** 60. **5.** 300. **6.** 400. **7.** 1,333⅓. **8.** 200. **9.** 80. **10.** 72. **11.** 150. **12.** 300. **13.** 8,000. **14.** 1,600.
1. 200. **2.** 400. **3.** 400. **4.** 600. **5.** 800. **6.** 10,000. **7.** 1,000. **8.** 20. **9.** 600. **10.** 400. **11.** 500. **12.** 800. **13.** 3002.8+. **14.** 3285.7+.

Page 36.—1. No. **2.** $1.00. **3.** $.81. **4.** $15. **5.** $10.29. **6.** $9.10. **7.** $7.19. **8.** 100; 75; 50; 67.5; 97.5; 118.75. **9.** 120%. **10.** 150%. **11.** 120%. **12.** 111⅛%. **13.** 126⅔%. **14.** 12.5%. **15.** 1.2%. **16.** 8⅓%. **17.** 200%. **18.** 108%. **19.** 100%.

Page 37.—1. Farmer, $.07575; transportation, $.01125; handling, $.027; delivery, $.036. **2.** $.0593; $.13. **3.** 54.4%. **4.** 2.3%; 25%; $3\frac{11}{13}$%. **5.** Feed, farm labor, interest on farm investment, etc.

Page 38.—1. $3,576.12. **2.** $1,172.76. **3.** $463.36; $63.36. **4.** *a*, $12, $388; *b*, $19, $456; *c*, $12, $788; *d*, $115.20, $460.80; *e*, $62.50, $2,437.50; *f*, $75, $1,175; *g*, $18.80, $3,724.70; *h*, $661.25, $1,976.35; *i*, $400, $3,504.80; *j*, $1,166.67, $496.83; *k*, $220, $2,525.80; *l*, $5,625, $1,709.52.

Page 39.—1. $50. **2.** 5%. **3.** $1,000. **4.** $80; $1,920. **5.** 6%; $2,820. **6.** 5%; $2,375. **7.** 4%; $144. **8.** 10%; $400. **9.** $50.40; $1,209.60. **10.** 10%; $1,692. **11.** 20%; $328. **12.** $4,000; 5%. **13.** $3,000; 25%. **14.** $1,600; $1,520. **15.** $1,500; $1,410. **16.** $3,600; $2,880.

Page 40.—1. 3,825. **2.** 36,445. **3.** 359.57. **4.** 55,165. **5.** 21,087. **6.** 206.875. **7.** 40.967. **8.** .476. **9.** 25⅛. **10.** 39. **11.** $58\frac{9}{20}$. **12.** ¾. **13.** 29.296. **14.** 9029.7. **15.** 20.0879. **16.** 401.933. **17.** $1\frac{9}{20}$. **18.** 12. **19.** 162. **20.** 5%. **21.** Multiply by 100; divide by 4, 2, 3, 8. **22.** 200. **23.** .5, .75, .875. **24.** .06, .025, 1.2. **25.** $31.

Page 41.—**1.** $3.50. **2.** $9.00. **3.** Shoes, $5; $.50; Hat, $4; $.60; Bicycle, $16; $4; Toilet set, $3; $.60. **4.** 25%. **5.** $.92. **6.** $30. **7.** $\frac{1}{4}$; 25%.

Page 42.—**1.** $16. **2.** 56 pupils. **3.** $1.50. **4.** $10.12. **5.** $1.73. **6.** 384 bu. **7.** $18\frac{1}{3}$%. **8.** 875 sq. mi. **9.** $31\frac{9}{11}$%. **10.** $4,931.50.

SECTION II

Page 43.—**1-5** answered in table below.

Item	Year	Month	Day
Gasoline	$148.26	$12.36	$0.41
Oil	12.70	1.06	.03½
Repairs	24.65	2.05	.07
Garage rent	84.00	7.00	.23
New equipment	64.72	5.39	.18
License	29.70	2.48	.08
Insurance	58.65	4.89	.16
Total	$422.68	$35.23	$1.17

Page 44.—**6** and **7.** See Table for p. 43. **8.** $.046. **9.** 25¢ more to ride in auto. **10.** $46; yes. **12.** $718.68. **13.** $4.60; $.184.

Page 45.—**1.** 23¢. **2.** $1.20. **3.** $5\frac{5}{23}$ times. **4.** $\frac{5}{16}$ lb.; 48¢. **5.** 4¢.

Page 46.—**1.** Sugar, $.025; butter, $.163; flour, $.012; milk, $.034; potatoes, $.014. **2.** $30\frac{4}{7}$%; $29\frac{7}{11}$%; 20%; $28\frac{1}{3}$%; 50%. **3.** $2.50. **4.** $2.352. **5.** $4.50. **6.** $8\frac{17}{26}$%.

Page 47.—**1.** .5¢, 1.5¢, 3.5¢, .4¢, 2.75¢, 9.75¢, 8¢, 10¢, 20¢, 10¢. **2.** 20%, 53.8%, 4%, 52.4%, 156%, 36.4%, 50%, 66.7%, 66.7%. **3.** 51.1%. **4.** 4%; 156%.

Page 48.—**1.** $4.77 less. **2.** About 2.75 times. **3.** 16.4%. **4.** $66.96.

Page 49.—**5.** $21.68. **6.** $45.28. **7.** Approx. 3 times. **8.** About $18\frac{1}{2}$%. **9.** About 4 times.

Page 50.—**1.** $25; $75. **2.** $4,950. **3.** $24.75; $74.75. **4.** $4,900. **5.** $24.50; it decreases.

6.

Payment	Principal	Interest	Total Payment	Payment	Principal	Interest	Total Payment
1	$5,000.00	$25.00	$75.00	7	$4,700.00	$23.50	$73.50
2	4,950.00	24.75	74.75	8	4,650.00	23.25	73.25
3	4,900.00	24.50	74.50	9	4,600.00	23.00	73.00
4	4,850.00	24.25	74.25	10	4,550.00	22.75	72.75
5	4,800.00	24.00	74.00	11	4,500.00	22.50	72.50
6	4,750.00	23.75	73.75	12	4,450.00	22.25	72.25

7. $3,000. **8.** 100. **9.** $62.50. **10.** $12.50.

Page 51.—1. $35. **2.** $6,960. **3.** $40.20.

4.

Payment	Principal	*Interest	Reduction of Principal	Payment	Principal	*Interest	Reduction of Principal
1	$7,000.00	$35.00	$40.00	7	$6,756.98	$33.78	$41.22
2	6,960.00	34.80	40.20	8	6,715.76	33.58	41.42
3	6,919.80	34.60	40.40	9	6,674.34	33.37	41.63
4	6,879.40	34.40	40.60	10	6,632.71	33.16	41.84
5	6,838.80	34.19	40.81	11	6,590.87	32.95	42.05
6	6,797.99	33.99	41.01	12	6,548.82	32.74	42.26

* Interest is computed on dollars only.

5. Less.

7.

Payment	Principal	*Interest	Reduction of Principal	Payment	Principal	*Interest	Reduction of Principal
1	$750.00	$3.75	$8.25	7	$699.88	$3.50	$8.50
2	741.75	3.71	8.29	8	691.38	3.46	8.54
3	733.46	3.67	8.33	9	682.84	3.41	8.59
4	725.13	3.63	8.37	10	674.25	3.37	8.63
5	716.76	3.58	8.42	11	665.62	3.33	8.67
6	708.34	3.54	8.46	12	656.95	3.28	8.72

* Interest is computed on dollars only.

Page 52.—1. Costs: steer, $52.50; corn, $15.60; corn stover, $1.28; alfalfa, $2.00; total, $76.38; selling price, $77.08; total receipts, $82.08; profit, $5.70. **2.** No. **3.** $2\frac{2}{3}$ lb. **4.** $7\frac{1}{2}$ lb.; $2\frac{6}{7}$ lb.; $2\frac{61}{112}$ lb. **5.** Costs: lamb, $3; corn, $.96; clover, $.75; total, $5.21; selling price, $5.55; profit, $.34.

Page 53.—6. $170. **7.** 24 lb.; $\frac{1}{4}$ lb.; $5\frac{7}{12}$ lb.; $5\frac{5}{24}$ lb. **8.** Costs: hog, $5.98; cornmeal, $1.98; middlings, $2.75; total, $11.46; selling price, $12.60; profit, $1.14. **9.** $2\frac{1}{12}$ lb. **10.** $1\frac{19}{25}$ lb.

Page 54.—1. 20 bd. ft. **2.** $8\frac{1}{3}$. **3.** $33\frac{1}{3}$. **4.** $1.00. **5.** $1.00.

Page 55.—1. 180,000 bd. ft.; 180 M. **2.** 120,000 bd. ft.; 60 M. **3.** $3,900. **4.** $1,580. **5.** $548. **6.** $60.80. **7.** 9,120 trees. **8.** 2,736; 6,384.

Page 56.—1. 24,700,000 oz. **2.** $61,265,880. **3.** About 5,079 oz. **4.** 23.22 gr. **5.** *a*, $.043; $.069.

Page 57.—1. 278,311. **2.** 12.24 million. **3.** $10\frac{4}{5}$ times. **4.** 14.88; 2.64. **5.** 4.38 million.

Page 58.—2. Finance, Electric l. & p., Service, Trans. and com., Trade, Others, Manufacturing, Mining, Construction, Forestry, Agriculture. **3.** Const., $59; E. L. & P., $124; Fin., $144; For., $41; Others, $91;

Man., $87; Min., $75; Ser., $98; Trade, $96; T. & C., $98. **4.** $384 ($32 monthly). **5.** $55.

Page 59.—1. $40. **2.** $12. **3.** $15.50. **4.** $13.00. **5.** $.31.

Page 60.—1. 90¢. **2.** 42¢. **3.** $38.60; $31.10. **4.** Bowen, daily: $2.50, $1.85, $3.925, $1.675, $4, $5.55; week, $19.50. Bartley, daily: $5, $4.675, $6.025, $9.75, $13.025, $22.50; week, $60.97.

Page 61.—1. $18; $18; $29. **2.** 40¢. **3.** $1.20. **4.** $22. **5.** $249.50.

Page 63.—Test in Fractions: **1.** $5\frac{5}{6}$. **2.** $8\frac{1}{2}$. **3.** $\frac{7}{20}$. **4.** $\frac{5}{6}$. **5.** $7\frac{1}{4}$. **6.** $22\frac{1}{2}$. **7.** $\frac{1}{3}$. **8.** $2\frac{1}{6}$. **9.** 3. **10.** 4. **11.** $2\frac{1}{3}$. **12.** $\frac{3}{10}$. **13.** $11\frac{14}{15}$. **14.** $12\frac{1}{4}$. **15.** $283\frac{1}{2}$.

Test in Decimals: **1.** .8. **2.** .625. **3.** 1.5. **4.** .03. **5.** .22. **6.** 5.4. **7.** 11.91. **8.** 10.4. **9.** 4.4. **10.** 50. **11.** .165. **12.** .349. **13.** 44.8. **14.** 16.175. **15.** 11. **16.** 31.20.

Test in Per Cents: **1.** 4%. **2.** 237.5%. **3.** 90%. **4.** 4.8. **5.** 30%. **6.** 24. **7.** 20.16. **8.** 5%. **9.** $4. **10.** 125%. **11.** 90. **12.** 640. **13.** $33\frac{1}{3}$%. **14.** 45. **15.** 240. **16.** 43.2.

Page 64.—1. 3,145. **2.** 518.19. **3.** 59,239. **4.** 541.579. **5.** 38,962. **6.** 36,893. **7.** 358. **8.** 739. **9.** $15\frac{11}{16}$. **10.** $11\frac{3}{4}$. **11.** 55. **12.** 5. **13.** 72.935. **14.** 120.037. **15.** 1.6056. **16.** 1304.91. **17.** 125. **18.** .75. **19.** 240. **20.** $12\frac{1}{2}$. **21.** $3.84. **22.** $85.50. **23.** $57. **24.** $\frac{7}{8}$. **25.** 3.5 sq. ft.

SECTION III

Page 65.—1. 77°; 29.94. **2.** 44°; 26.5°; 8.5°. **3.** 20.92; 17.32; 14.24. **4.** About $3\frac{1}{2}$°; about 3.0. **5.** 19°.

Page 66.—Oral.

Page 67.—1. The number of examples correct. **2.** The per cent of pupils having each number correct; 35. **3.** 10%. **4.** 15% had 11 correct, 25% had 12, 20% had 13, 5% had 14, 10% had 15; 5% had 16, and 10% had 17. **5.** 12. **6.** 15 and 17. **7.** 4, 6, 10, 8, 2, 4, 2, 4. **8.** 20 pupils; 4 pupils; none.

Page 68.—1. 3,400,000. **2.** 1867 to 1871. **3.** 1901 to 1911. **4.** 3,200,000. **5.** 5,500,000. **6.** 60%. **7.** A little more than one million.

Page 69.—1. The heavy line. **2.** The dotted line.

3.

Years	Boys	Girls	Years	Boys	Girls	Years	Boys	Girls
5	40	37	11	68	65	17	125	114
6	44	41	12	74	75	18	131	116
7	48	45	13	80	90	19	135	118
8	52	49	14	90	100	20	137	119
9	57	54	15	105	105	21	140	120
10	63	59	16	120	110			

4. From 4 to $11\frac{1}{2}$ and from 16 to 21. **5.** From $11\frac{1}{2}$ to 15. **7.** 120 lb.; 105 lb. **8.** Because the change in weight from year to year is gradual.

Page 70.—Oral.

Page 71.—**1.** See graph or table below it. **2.** Salmon, 67,000 tons; cod, 73,000; herring, 123,000; haddock, 18,000; all others, 107,000. **3.** 25.1%.

4. Salmon	$7,998,000	Haddock	$1,341,600
Cod	2,812,200	Lobster	4,953,600
Herring	2,218,800	All others	6,475,800

5. 111.6°. **6.** Cod, 39.24°; herring, 30.96°; haddock, 18.72°; lobster, 69.12°.

Page 72.—**1.** 791,670 sq. mi. **2.** About $12\frac{1}{2}$ times. **4.** 33.6+%. **5.** 3,800 million cu. ft.

Page 73.—**1.** Agr., 1,300 million; For., 480; Fish., 100; Trap., 20; Min., 380; El. power, 190; total, 2,470 million. **2.** Agr., 1,100 thousand; man., 650; trade, 350; finance, 100; total, 2,200 thousand (2,200,000).

Page 74.—

1. Brazil	1,900 million	Salvador	100 million
Colombia	400 "	Venezuela	100 "
Netherland East Indies	200 "	Guatemala	100 "

3. In manufacturing: Belgium, 40%; United Kingdom, 39%; Germany, 38%; Netherlands, 36%. In agriculture: Belgium, 20%; United Kingdom, 17%; Germany, 31%; Netherlands, 23%. In mining: Belgium, 7%; United Kingdom, 8%; Germany, 3%; Netherlands, 2%.

Page 75.—**1.** Cattle: March and January; calves: Sept. and Nov.; swine: July and Sept. **2.** Cattle, 34.4 lb.; calves, 49.4 lb.; swine, 25.6 lb. **3.** Cattle, in May; calves, in March; swine, in Sept. **4.** Cattle, increased first period, then decreased; calves, increased first period, then decreased; swine, increased to Sept. and then decreased. **5.** Cattle, 948.8 lb.; calves, 177.76 lb.; swine, 224.16 lb.

Page 76.—**6.** Cattle, $6.76; calves, $7.74; swine, $7.96. **7.** $4,038.02. **8.** March, 101.4%; May, 102.4%; July, 107.2%; Sept. 135.8%; Nov., 127.08%. **13.** B, 90,000,000; A, 120,000,000.

Page 77.—Practice Test in Fractions II: **1.** $\frac{5}{21}$. **2.** $1\frac{1}{3}$. **3.** 16. **4.** $5\frac{5}{12}$. **5.** $8\frac{2}{5}$. **6.** $4\frac{7}{15}$. **7.** $5\frac{9}{20}$. **8.** $1\frac{7}{15}$. **9.** $\frac{4}{5}$. **10.** $6\frac{7}{12}$. **11.** $2\frac{32}{35}$. **12.** $6\frac{5}{8}$. **13.** $\frac{2}{5}$. **14.** $2\frac{1}{15}$. **15.** $688\frac{1}{2}$.

Practice Test in Decimals II: **1.** 1.6. **2.** .23. **3.** .24. **4.** 4. **5.** .025. **6.** .78. **7.** 30. **8.** 28. **9.** 62.1. **10.** 24.425. **11.** 3.05. **12.** .05. **13.** 4.637. **14.** 120. **15.** 110. **16.** 4.784.

Practice Test in Per Cent II: **1.** 20%. **2.** $12\frac{1}{2}$%. **3.** $33\frac{1}{3}$%. **4.** 25%. **5.** 12.18. **6.** 35. **7.** 60. **8.** 20%. **9.** 600. **10.** $12\frac{1}{2}$%. **11.** 150. **12.** 125. **13.** 270. **14.** 200%. **15.** 260. **16.** $1.50.

Page 78.—**1.** 3,079. **2.** 81,605. **3.** 97.496. **4.** 56,536. **5.** 50,098. **6.** 415. **7.** 42.5054. **8.** 844.436. **9.** $21\frac{23}{24}$. **10.** $12\frac{1}{24}$. **11.** $72\frac{1}{2}$. **12.** $13\frac{1}{2}$. **13.** 96.794. **14.** 474.096. **15.** 2049.13. **16.** .488. **17.** $17.25. **18.** $4.50. **19.** 117. **20.** $6\frac{1}{4}$%. **21.** $\frac{3}{8}$. **22.** 10%. **23.** $9. **24.** $531. **25.** 65 cu. ft.

Page 79.—**1.** 12. **2.** 4. **3.** 60. **4.** 144. **5.** 4. **6.** 16. **7.** $\frac{1}{8}$. **8.** 2. **9.** 36. **10.** 32. **11.** 24. **12.** $16\frac{1}{2}$. **13.** 2,000. **14.** $\frac{1}{2}$. **15.** 8. **16.** 160. **17.** $\frac{3}{4}$. **18.** 5,280. **19.** 9. **20.** 32. **21.** $\frac{1}{3}$. **22.** $1\frac{1}{4}$. **23.** 16. **24.** $\frac{1}{10}$. **25.** 27. **26.** Ounces.

Page 80.—1. $150. **2.** 140 mi. **3.** $459. **4.** $756. **5.** $7.74. **6.** About $16\frac{2}{3}$¢. **7.** 25.92 mi. per hr. **8.** $36\frac{6}{19}\%$. **9.** $66.67. **10.** $27\frac{9}{13}$ mi. per hour.

SECTION IV

Page 82.—1. $450. **2.** $816.16. **3.** William, $.96; John, $.60; Henry, $.50; Dick, $.90; George, $1.00; Carl, $.48; Edward, $1.24; Arthur, $.88; Keith, $.55; Fred, $.72; Leo, $.75; Elmer, $.42. **4.** W., $48.96; J., $30.60; H., $25.50; D., $45.90; G., $51; C., $24.48; Ed., $63.24; A., $44.88; K., $28.05; F., $36.72; L., $38.25; El., $21.42. **5.** $807.16. **6.** $67.26. **7.** W., $116.22; J., $97.86; H., $92.76; D., $113.16; G., $118.26; C., $91.74; Ed., $130.50; A., $112.14; K., $95.31; F., $103.98; L., $105.51; El., $88.68. **8.** $13\frac{7}{9}\%$; $5\frac{1}{3}\%$; $11\frac{1}{9}\%$.

Page 83.—1. $3.00. **2.** $159; $16. **3.** $125; 12.5%. **4.** $500; $8\frac{1}{3}\%$. **5.** $800; $11\frac{1}{9}\%$. **6.** $700; $8\frac{1}{3}\%$. **7.** 475; 5%. **8.** $3,600; 6%. **9.** $7,700; 10%. **10.** $5,000; 20%. **11.** $5,124; 8%. **12.** (4) $9\frac{1}{11}\%$; (5) $12\frac{1}{2}\%$; (6) $9\frac{1}{11}\%$; (7) 5.26%. **13.** (8) 14%; (9) 17.27%; (10) 8%; (11) 13.93%.

Page 84.—14. 30%; 70%. **15.** $80. **16.** $80. **17.** $60. **18.** $120. **19.** $660. **20.** Overhead, $15,680; profit, $4,200; costs, $36,120.

Page 86.—4. $402.08. **5.** $8.04.

Making out bills: **1.** $2.20. **2.** $13.50. **3.** $21.

Page 87.—1. $400. **2.** $750. **4.** $600. **5.** $617.50. **6.** $420. **7.** $585. **8.** $574.56. **9.** $533.61. **10.** $534.37. **11.** $601.60. **12.** $654.07. **13.** $514.08.

Page 88.—14. $456.40. **15.** $290.32. **20.** Net price would be the same; order of discounts does not affect the result.

Page 89.—1. $324\frac{9}{16}$ lb. **2.** $48\frac{9}{16}$ lb. **3.** $8.7935; $.05. **4.** 1¢ less. **5.** 2¢.

Page 90.—1. $226.75.

Page 91.—3. $22\frac{9}{25}$. **4.** $25.13. **5.** $300.

Page 92.—1. *c, d, a, b*; *c*. **2.** *d, b, c, a*; *d*. **3.** *d, c, a, b*; *d*.

Page 93.—1. Oral. **2.** $30,810,000; $370,310,000. **3.** $1\frac{3}{4}$; $2\frac{2}{3}$; 5; $14\frac{1}{2}$; $23\frac{9}{25}$. **4.** $1,800,000; $2,500,000; No; the rates would increase. **5.** 48.6%; 56.9%; 93.9%; 55.1%; 43.3%; 57.8%. **6.** Increased: 1880–1910; decreased: 1910–1930.

Page 95.—1. Greater fire hazard. **2.** Greater fire hazard. **4.** $5.20; $13. **5.** $21.60; $54. **6.** $101.25. **7.** *a*, $3; *b*, $4.50; *c*, $72; *d*, $56.25. **8.** $16.25; $45.50. **9.** $23.25; $63.75; $6.00. **10.** $2,983.20.

Page 100.—1. Limited payment life policy. **2.** Term policy.

Page 101.—3. Ordinary life policy. **4.** Endowment policy.

Premium rates: **1.** 20-yr. endowment. **2.** Ordinary life. **3.** O. L., $1.90; 20-yr. E., $.24; 20-yr. L. P., $2.37. **4.** The probability of living is greater. **5.** $140.25; $166.35; $201.35.

Page 102.—7. $19.28. **8.** $1,732. **10.** $678.80; less. **11.** $877.20. **12.** 21 premiums, $316.47; 41 premiums, $617.87. **14.** *a*, $90.42; *b*, $86.60; *c*, $109.86; *d*, $157.02; *e*, $78.02.

Page 103.—**15.** *a*, $7.54; *b*, $7.22; *c*, $9.16; *d*, $13.09; *e*, $6,501.
How a Life Insurance Company Uses Its Premiums: **1.** $37.73; $75.46.

Page 104.—**2.** $202.66. **3.** $136.35. **4.** 36.4%. **5.** $64.95; $4.32.

Page 106.—**1.** $193,500, real estate; $24,000, personal property; total, $217,500.

Page 107.—**2.** Largest: Mr. Winters, Mr. Moore. Smallest, Mr. Ableman, Mr. Clancy. **3.** Brown, $108.80; Jurgens, $146.40; Murdock, $117.60; Jones, $165.60; Severson, $79.20; Clancy, $42.40; Moore, $260; Williams, $129.60; Jenks, $169.60; Ableman, $33.60; Winters, $301.60; Sommers, $185.60; total tax, $1,740. **4.** $.006. **7.** $15.84. **8.** Yes.

Page 108.—**1.** $50. **2.** $175. **3.** 2.1¢. **4.** .7¢. **5.** .12¢; 1.25¢; 3.75¢; .5¢; 4¢.

Page 109.—**6.** $4.20. **7.** $141. **8.** $468. **9.** 28 mills; $2\frac{3}{4}$%; $2.60 a hundred; $25.89 a thousand.

10.

Cents on $1.00	Per Cent	Mills on a Dollar	Dollars on a Hundred	Dollars on a Thousand
a. $4\frac{1}{2}$	$4\frac{1}{2}$	45	4.50	45
b. 3	3	30	3.00	30
c. .375	.375	3.75	.375	3.75
d. 3.6	3.6	36	3.60	36
e. 4.575	4.575	45.75	4.575	45.75

11. $157.50. **12.** $180. **13.** $51.20. **14.** $135. **15.** $467.50.

Page 110.—**16.** $521.90. **17.** 2.4¢; 2.4%; 24 mills; $2.40. **18.** $2.60. **20.** $194.40.
Taxes in City of Bland: **1.** $195,129.39.

Page 111.—**2.** 48.6%; 51.4%. **3.** $.037. **4.** County, $.664; city, $1.242; school, $1.803.

5.

Present Owner	Assessed Real Estate	Valuation Personal Property	School Tax	County Tax	City Tax	Total Tax
Mr. A....	$6,500	$500	$126.21	$46.48	$86.94	$259.63
Mr. B....	3,200	200	61.30	22.58	42.23	126.11
Mr. C....	8,800	900	174.89	64.41	120.47	359.77
Mr. D....	12,600	3,400	288.48	106.24	198.72	593.44
Mr. E....	18,500	6,500	450.75	166.00	310.50	927.25
Mr. F....	7,500	1,000	153.26	56.44	105.57	315.27

6. $12. **8.** $20.

Page 112.—**10.** $9,000. **11.** $18,600,000.
An Important Point: **1.** $5,600; $4,200. **2.** $252; $281.40; $29.40.

Page 113.—**1.** $10. **2.** $8. **3.** $56. **4.** $393.75.

Page 114.—Oral.

Page 115.—**6.** $175. **7.** $112.50. **8.** $10. **9.** $75. **10.** $60. **11.** $88. **12.** $100. **13.** $90; $450. **14.** $18. **15.** $131.25. **16.** $11.75. **17.** 25%.

Page 116.—**18.** *a*, $847.80; *b*, $2,745.36. **19.** $59.

Page 117.—Completing table: interest Oct. 31, $.29; balances: May 1, $18.61; July 2, $23.23; Sept. 2, $49.23; Oct. 15, $41.18; Oct. 31, $41.47; Dec. 1, $46.47.

Page 118.—$\frac{1}{40}$; $\frac{3}{100}$; $\frac{7}{200}$; $\frac{1}{25}$; $\frac{1}{20}$. **1.** $26.13. **2.** $18.63, $23.23, $49.23, $41.18, $41.47, $46.47. **3.** $18, $18, $23, $23, $49, $41. **4.** $.29; $41.47. **5.** $46.47. **6.** $46.92. **7.** $1.32; $2.39. Balance Oct. 31, 1936, $242.23. Balances: Jan. 1, 1935, $140.75; Feb. 5, 1935, $206.30; April 4, 1935, $241.30; April 30, 1935, $242.64; June 15, 1935, $202.64; Sept. 3, 1935, $255.14; Oct. 31, 1935, $257.40; Jan. 2, 1936, $237.40; April 30, 1936, $239.84; Oct. 31, 1936, $242.23. Interest: April 30, 1935, $1.32; Oct. 31, 1935, $2.26; April 30, 1936, $2.44; Oct. 31, 1936, $2.39. **8.** Mar. 31, June 30, Sept. 30, Dec. 31.

Page 119.—**1.** Interest for one year. Each block represents $2.00. **2.** The principal up to $500. Each block represents $25. **3.** $4.00. **4.** $8.00, $2.00, $12, $14, $10. **5.** $200. **6.** $100, $150, $250, $300, $400. **8.** $16. **9.** $18. **10.** $8.00. **11.** $5.00. **12.** 6.66\frac{2}{3}$. **13.** $90. **14.** $8.00. **15.** $112.

Page 121.—**1.** $1.36. **2.** $3.96. **3.** $4.66. **4.** $6.18. **5.** $2.24. **6.** $2.29. **7.** $4.30. **8.** $11.03. **9.** $6.99. **10.** $8.05. **11.** $8.22. **12.** $22.44. **13.** $4.88. **14.** $18.02. **15.** $16.93. **16.** $22. **17.** $19.44. **18.** $7.88. **19.** $19.56. **20.** $29.61. **21.** $251.36.

Pages 122-125.—Oral.

Page 126.—**1.** Oct. 14, 1930. **2.** Jan. 15, 1932. **3.** Nov. 2, 1930. **4.** Apr. 4, 1931. **5.** April 3, 1932. **6.** Aug. 21, 1931. **7.** 35 days. **8.** 67 days.

Page 128.—**1.** $.42; 232 days. **2.** Jane, 102 days, interest $.42; Susan, 109, $.45; Jean, 113, $.47; Rose, 123, $.51; Ada, 141, $.58; Marion, 150, $.62; Carol, 156, $.64; Bessie, 170, $.70; Eleanor, 177, $.73; Myrtle, 189, $.78; Mildred, 204, $.84; Hope, 214, $.89. **3.** No.

Page 129.—**1.** $5.29. **2.** $15.53. **3.** $191.10. **4.** $54.25. **5.** $683.20. **6.** $125.68. **7.** $261.53. **8.** $21.24. **9.** $125.70. **10.** $14.24. **11.** $984.42. **12.** $2.98. **13.** $25.10.

Page 130.—**14.** John, $.19 interest, $8.69 amount; Henry, $.20; $9.60; Robert, $.16, $7.36; William, $.17, $8.17; Charles, $.18, $8.42; Sam, $.19, $9.54; Dick, $.16, $7.76; Ed, $.18, $8.83; Thomas, $.16, $7.91; Philip, $.15, $7.05. **15.** $270. **16.** Sept. 4, 1935; Sept. 4, 1936; Sept. 4, 1937; Sept. 4, 1938; $1,041.98.

Page 131.—**17.** 12+ or 13 weeks.

Page 132.—**3.** $9.25.

Practice in Using Interest Table: **1.** $1.48. **2.** $8.93. **3.** $3.95. **4.** $3.70. **5.** $9.41. **6.** $8.38. **7.** $14.41. **8.** $.44. **9.** $6.60. **10.** $2.42. **11.** $9.04. **12.** $8.37. **13.** $4.52. **14.** $3.06. **15.** $6.70. **16.** $15.39. **17.** $12.16. **18.** $1.90. **19.** $1.11. **20.** $4.11. **22.** (1) $1.23; (2) $7.40; (3) $3.29; (4) $3.08; (5) $7.96; (6) $6.99; (7) $12.02; (8) $.43.

SIMPLE INTEREST TABLE—RATE 5%

Days	$900	$800	$700	$600	$500	$400	$300	$200	$100
90....	$11.097	$9.864	$8.631	$7.398	$5.965	$4.932	$3.699	$2.466	$1.233
60....	7.398	6.576	5.754	4.932	4.110	3.288	2.466	1.644	.822
50....	6.165	5.480	4.795	4.110	3.425	2.740	2.055	1.370	.685
40....	4.932	4.384	3.836	3.288	2.740	2.192	1.644	1.096	.548
30....	3.699	3.288	2.877	2.466	2.055	1.644	1.233	.822	.411
20....	2.466	2.192	1.918	1.644	1.370	1.096	.822	.548	.274
10....	1.233	1.096	.959	.822	.685	.548	.411	.274	.137
9....	1.107	.984	.861	.738	.615	.492	.369	.246	.123
8....	.981	.872	.763	.654	.545	.436	.327	.218	.109
7....	.864	.768	.672	.576	.480	.384	.288	.192	.096
6....	.738	.656	.574	.492	.410	.328	.246	.164	.082
5....	.612	.544	.476	.408	.340	.272	.204	.136	.068
4....	.495	.440	.385	.330	.275	.220	.165	.110	.055
3....	.369	.328	.287	.246	.205	.164	.123	.082	.041
2....	.243	.216	.189	.162	.135	.108	.081	.054	.027
1....	.126	.112	.098	.084	.070	.056	.042	.028	.014

Page 133.—**1.** $4.00. **2.** $4.04. **3.** $408.04. **4.** $4.08. **5.** $416.24 **6.** $16.24.

Page 134.—**7.** $48. **8.** $2.46. **9.** $41.22; $1.22. **10.** $811.36. **11.** $211.36. **12.** $1.00. **13.** $.66$\frac{2}{3}$. **14.** $.83.

Page 135.—**17.** $49.94; $449.94. **18.** $161.63; $911.63. **19.** $61.51; $861.51.

Page 136.—Oral.

Page 137.—Oral.

Page 138.—Practice Test in Fractions III: **1.** $6\frac{2}{3}$. **2.** $11\frac{1}{4}$. **3.** $17\frac{1}{2}$. **4.** $4\frac{1}{4}$. **5.** $\frac{3}{5}$. **6.** $6\frac{1}{2}$. **7.** 2. **8.** $1\frac{7}{20}$. **9.** $\frac{5}{12}$. **10.** $1\frac{7}{12}$. **11.** 40. **12.** $4\frac{23}{24}$. **13.** $1\frac{19}{24}$. **14.** $15\frac{1}{10}$. **15.** $1\frac{9}{11}$. **16.** 4.

Practice Test in Decimals III: **1.** 1.66. **2.** .02. **3.** .056. **4.** 2.1. **5.** 13.12. **6.** 4.4. **7.** .596. **8.** 5.714+. **9.** .08. **10.** .048. **11.** 38.425. **12.** 2.636. **13.** 16.575. **14.** .162. **15.** .2412. **16.** 12.2.

Practice Test in Per Cents III: **1.** 120%. **2.** 12.5%. **3.** 12.5%. **4.** 80. **5.** 5%. **6.** 96. **7.** 25%. **8.** 13. **9.** 240. **10.** 120%. **11.** 34. **12.** 200%. **13.** 540. **14.** 2.5. **15.** 80. **16.** $3.00.

Page 139.—**1.** 3,817. **2.** 79,164. **3.** 604,800. **4.** 53.92. **5.** $17\frac{17}{24}$. **6.** $50\frac{1}{12}$. **7.** 72. **8.** $3\frac{3}{4}$. **9.** 63.665. **10.** .3215. **11.** 7624.49. **12.** $52.65. **13.** 48%. **14.** $350. **15.** $128.25. **16.** .6875, 68.75%. **17.** 55.896. **18.** 2.86. **19.** $10.26. **20.** ~~10%~~. **21.** $2. **22.** $18\frac{1}{3}$ sq. ft. **23.** 1.8 cu. ft. **24.** $8\frac{1}{2}$ yd. **25.** $13.

Page 140.—**1.** $18 **2.** 5.6°. **3.** $10.56. **4.** 6%. **5.** $529.20. **6.** $760.50. **7.** $497.28. **8.** $6.75. **9.** $10.000. **10.** $1\frac{1}{5}$¢.

SECTION V

Page 141.—Oral.

Page 142.—**1.** 158.95 mi. **2.** 37.4 mi. an hr. **3.** 10 towels. **4.** 72 in. **5.** $4.08. **6.** $5.00. **7.** $100. **8.** $6.00. **9.** 25%. **10.** 14 in. **11.** 60 sq. in. **12.** 1,680 cu. in. **13.** 180 sq. in.

Page 143.—**1.** $c = np$. **2.** The area of a rectangle equals its length *multiplied by* its width. **3.** $d = rt$. **4.** The perimeter of a square equals *four times the length of one of its sides.* **5.** $r = \frac{d}{t}$. **6.** The time required to travel a certain distance equals *the distance divided by the rate of speed.* **7.** $w = an$. **8.** $w = \frac{e}{n}$. **9.** $v = lwh$. **10.** The number of bushels equals the number of quarts divided by *32*. **11.** The average weight of a number of apples equals their total weight *divided by* the number of apples. **12.** The price of one quart equals the price of a gallon *divided by* 4. **13.** Gain equals *selling price minus the cost.* **14.** $l = c - s$.

Page 144.—**1.** The area of a rectangle equals altitude times the base. **2.** The area of a triangle equals one-half the base times the altitude. **3.** The circumference of a circle equals two times π times the radius. **4.** The perimeter of a square equals four times the length of a side. **5.** The volume of a rectangular solid equals length times width times height. **6.** The interest is equal to the principal times the rate times the time. **7.** The perimeter of a rectangle equals twice the length plus twice the width. **8.** The area of a circle equals π times the radius squared. **9.** The diameter of a circle equals twice the radius. **12.** 3. **13.** 4. **14.** 4. **15.** 3. **16.** 2. **17.** 5. **18.** 5.1. **19.** $1\frac{2}{3}$. **20.** $2\frac{3}{4}$. **21.** 7 in. **22.** $17\frac{1}{2}$ ft.; $3\frac{1}{2}$ in.; 14 yd.; $15\frac{10}{11}$ ft.

Page 145.—**2.** 9 ft. **3.** 6%. **4.** $375. **5.** 3%. **6.** 8 ft. **7.** $1,000. **8.** $570. **9.** $724.

Page 146.—**1.** 4. **2.** 5. **3.** 22¢. **4.** *a*, $4n + 5 = 17$; *b*, $n + 5 = 14$; *c*, $n - 10 = 6$; *d*, $6n + 5 = 35$; *e*, $c + \$2 = \$7.50$; *f*, $5n - 6 = 34$; *g*, $n + 5 = 6$; *h*, $2n = n + 5$; *i*, $n - 9 = 7$. **5.** *a*, A number plus 4 equals 15; *b*, Four times a number plus 2 equals 18; *c*, A number less 5 equals 12; *d*, Cost minus $.25 equals $.75; *e*, The perimeter of a square equals 16; *f*, Twice a number plus 12 equals 6; *g*, Interest equals $25 times .06 times 3; *h*, $7.20 equals principal times .06 times 2.

Page 147.—**2.** $7a$. **3.** $12a$. **4.** $17a$. **5.** $9c$. **6.** $6x$. **7.** $10x$. **9.** $8a$. **10.** $4a$. **11.** $6a$. **12.** $6x$. **13.** $5x$. **14.** $16y$. **15.** $11a$, $20a$, $3a$, $15a$.

Page 148.—**17.** $2\frac{1}{4}$ in.; $1\frac{1}{2}$ in.; 4 in. **18.** $4x + 3x + 2x = 2\frac{1}{4}$; $x = \frac{1}{4}$; $x + x + 2x + 2x = 1\frac{1}{2}$; $x = \frac{1}{4}$; $5x + 5x + 3x + 3x = 4$; $x = \frac{1}{4}$. **19.** 2 in., 3 in., 4 in.

Page 149.—**1.** 22.5°. **2.** 20°. **3.** 20°. **4.** 22.5°. **5.** 60°. **6.** 22.5°. **7.** 40°. **8.** 30°. **9.** 14.4°. **10.** 18°. **11.** A = 40°, B = 80°, C = 60°, D = 126°, E = 18°, F = 36°, G = 18°, H = 72°, I = 90°, J = 60°, K = 60° L = 60°. **13.** Yes.

Page 150.—**3.** 8. **4.** 8. **5.** 2. **6.** 17. **7.** 11. **8.** $\frac{1}{4}$. **9.** 3. **10.** $1\frac{1}{2}$. **11.** 4. **12.** $4\frac{4}{5}$. **13.** 2. **14.** 20.7. **15.** No. **16.** 6¢. **17.** 6.

Page 151.—**2.** 18. **3.** 17. **4.** 1. **5.** 12. **6.** 21. **7.** 8. **8.** 3.5. **9.** $10\frac{1}{2}$. **10.** $5\frac{1}{4}$. **11.** 9. **12.** 11. **13.** 10. **14.** 18. **15.** 23. **16.** 15.1. **17.** $n - 8 = 28$; $n = 36$.

Practice in Solving Equations: **1.** 4. **2.** 9. **3.** 15. **4.** 3. **5.** 14. **6.** 3. **7.** 9. **8.** 2.5. **9.** 10. **10.** 3. **11.** 2. **12.** 10. **13.** 2. **14.** 86. **15.** 5. **16.** By addition: 3, 5, 9, 12, 14; by subtraction: 2, 7, 10, 11, 15; by division: 1, 4, 6, 8, 13.

Page 152.—**1.** 50. **2.** 18. **3.** 16. **4.** 45. **5.** 10. **6.** 1. **7.** 3. **8.** $7\frac{1}{2}$. **9.** $2\frac{1}{4}$. **10.** 75. **11.** 27.

Practice in Solving Equations: **1.** 3. **2.** 2. **3.** 9. **4.** 48. **5.** 4. **6.** 9. **7.** $4\frac{1}{2}$. **8.** 3. **9.** 11. **10.** 1. **11.** 2. **12.** 12. **13.** $\frac{3}{4}$. **14.** 35. **15.** 3. **16.** 9. **17.** $1\frac{1}{2}$. **18.** 1.5.

Page 153.—**19.** By addition: 3, 9, 12, 16; by subtraction: 2, 5, 6, 10, 15; by multiplication: 4, 11, 14, 17; by division: 1, 7, 8, 13, 18.

Picturing Equations: **1.** 3. **2.** 20. **3.** 15. **4.** 18. **5.** 3. **6.** 8. **7.** 2. **8.** 8. **9.** 10. **10.** 2. **11.** 8. **12.** 3. **13.** 24. **14.** 10. **15.** 7. **16.** 4.

Page 154.—Subtract 5 from both sides of the equation. **2.** Multiply both sides of the equation by 4. **3.** Add 5 to both sides of the equation. **4.** Divide both sides of the equation by 4. **5.** *a*, Principle *d*; *b*, principle *a*; *c*, principle *c*; *d*, principle *b*; *e*, principle *d*; *f*, principle *c*. **6.** Principle *c*.

Page 155.—**1.** $3.50. **2.** $250. **3.** 10%. **4.** $200. **5.** $500. **6.** 20%. **7.** 5%. **8.** $54. **9.** $60. **10.** $500. **11.** 5%. **12.** $96.

Page 156.—**1.** 2 yr. **2.** 5%. **4.** 5%. **5.** 2 yr. **6.** $2,500. **7.** $3,000. **8.** 6%. **9.** 3 yr. **10.** $1,000. **11.** 5%. **12.** 3 yr. **13.** $12,000. **14.** $4\frac{1}{2}$%. **15.** 6 months.

Page 157.—**4.** 10. **5.** 2. **6.** 6. **7.** 5. **8.** 20. **9.** 21.

Page 158.—**1.** 6. **2.** 9. **3.** 5. **4.** 2. **5.** 4. **6.** 4. **7.** 2. **8.** 5. **9.** 3. **10.** 7. **11.** 3. **12.** 7. **13.** 10. **14.** 48. **15.** 5. **16.** 20. **17.** 40. **18.** 21. **19.** 1. **20.** 2. **21.** 7. **22.** 4. **23.** 6. **24.** 5. **25.** 15. **26.** 42. **27.** 12. **28.** 10. **29.** 21. **30.** 8. **31.** 2. **32.** 18. **33.** $3\frac{1}{5}$. **34.** $8\frac{1}{2}$. **35.** 4. **36.** 4. **37.** 6. **38.** 32. **39.** 6.

Page 159.—**1.** *a*, 48; *b*, 20; *c*, 6. **2.** *a*, 12; *b*, 10; *c*, 12. **3.** *a*, 28; *b*, 4; *c*, 7. **4.** *a*, 22; *b*, 14. **5.** *a*, 8; *b*, 4; *c*, $3\frac{3}{4}$. **6.** *a*, $20.10; *b*, $9.80; *c*, $14.95. **7.** *a*, $202.

Page 160.—**2.** $3\,x$; $3\,x + x$. **3.** 20 lb. corn; 10 lb. wheat. **4.** 3 ft.; 6 ft. **5.** $450; $350. **6.** 5¢; 10¢. **7.** 3 in.; 5 in.

Page 161.—**1.** $4.00.

Page 162.—**2.** 5 gal.; $.20. **3.** $1.60, $2.40, $3, $3.60. **4.** 5 gal., 8 gal., 15 gal. **6.** $.50; $1.00; $1.50; $2.00; $2.50; $3.00; $3.50; $4.00; $4.50; $5.00.

Page 163.—**7.** 1 hr.; $1.00. **8.** $7.50; $12.50; $20. **9.** 8 hr.; 10 hr.; 16 hr. **10.** $w = .60\,h$. **11.** $2.40; $4.80; $7.20; $9.60; $12; $14.40; $16.80; $19.20; $21.60; $24; $26.40.

Page 164.—**3.** −6°, −9°, $-2\frac{1}{2}$°. **4.** +7°, −3°, −6°, +50°, **5.** 20°.

Page 165.—7. 2 in.; 10 in. **8.** 17°; 17°.

Positive and Negative Numbers: **2.** Because it is a liability, not an asset. **3.** −5. **4.** 170 ft. **5.** 1,992 yr.

Page 166.—1. 1 gal. **2.** $33\frac{1}{3}\%$. **3.** 10 qt. **4.** $3\frac{1}{3}$ qt. **5.** 1 gal.; 3.2 qt.; 1.6 qt. **6.** −10°. **7.** Approx. −200°.

Page 168.—3. *a*, 35°, subtraction; *b*, 50°, addition.

Page 169.—1. 64 acres. **2.** 16%. **3.** 115%. **4.** 11.84 mi. **5.** $47\frac{23}{33}\%$. **6.** $2\frac{7}{79}$ times. **7.** $86.91. **8.** $518.40. **9.** 1,250 sq. ft.

Page 170.—4. *a*, 4; *b*, $2\frac{3}{5}$; *c*, 8; *d*, 18; *e*, 27; *f*, 2; *g*, 20; *h*, $.06. **5.** *a*, 6; *b*, 2; *c*, 4; *d*, $6\frac{2}{5}$; *e*, 5; *f*, 21. **6.** 5 in. **7.** 1 yr. **8.** 4%. **9.** Base, 9 ft., altitude, 12 ft., hypotenuse, 15 ft. **10.** $22\frac{1}{2}°$; 45°; $112\frac{1}{2}°$ **11.** Graph.

Page 171.—1. 4,241. **2.** 16,647. **3.** 382,320. **4.** 771. **5.** $22\frac{1}{4}$. **6.** $10\frac{11}{12}$. **7.** 42. **8.** $7\frac{1}{2}$. **9.** 54.025. **10.** 2.2356. **11.** 76.8. **12.** 330. **13.** 625. **14.** 30%. **15.** 21′ 3″. **16.** 186.225. **17.** *a*, .875; *b*, .025. **18.** By 25: *a*, 1,500; *b*, 6,000; *c*, 2,100. by 50: *a*, 3,000; *b*, 12,000; *c*, 4,200. by $33\frac{1}{3}$: *a*, 2,000; *b*, 8,000; *c*, 2,800. **19.** 3.731. **20.** 22. **21.** 21. **22.** $3\frac{3}{4}$. **23.** 27. **24.** $1\frac{1}{3}$. **25.** 5.

Page 172.—Practice Test in Fractions IV: **1.** $6\frac{1}{2}$. **2.** $7\frac{2}{3}$. **3.** 18. **4.** $22\frac{1}{2}$. **5.** 1. **6.** $12\frac{1}{2}$. **7.** $15\frac{2}{3}$. **8.** 2. **9.** $5\frac{1}{2}$. **10.** 4. **11.** $6\frac{1}{12}$. **12.** $\frac{1}{2}$. **13.** $15\frac{1}{14}$. **14.** $56\frac{7}{15}$. **15.** $2\frac{1}{2}$.

Practice Test in Decimals IV: **1.** 2.5. **2.** 2.8. **3.** .105. **4.** 1.96. **5.** .054. **6.** .0214. **7.** .77. **8.** .028. **9.** 25.9. **10.** 29.81. **11.** .6848. **12.** .048. **13.** 12. **14.** .352. **15.** 43.8. **16.** 5.

Practice Test in Per Cent IV: **1.** $162\frac{1}{2}\%$. **2.** 250%. **3.** .065. **4.** 5%. **5.** 40. **6.** 5%. **7.** 72. **8.** 200. **9.** 200%. **10.** 90. **11.** 7%. **12.** 300. **13.** 90. **14.** 160. **15.** .2%. **16.** 1,500.

SECTION VI

Page 173.—1. 36′ × 78′. **2.** $1\frac{1}{5}$ in. **3.** $2\frac{7}{16}$ in. **4.** Larger, $4\frac{1}{2}'' \times 9\frac{3}{4}''$.

Page 183.—1. *ACG* and *ACD;* congruent because 2 angles and included side of one = 2 angles and included side of the other. **2.** *AD;* measure from *A* to *D*. **3.** 120′. **4.** 80′, because it is one of the two opposite and equal sides of a parallelogram. **5.** 100′; same reason as **4.** **6.** 9; opposite side of a parallelogram. **7.** 12; opposite side of a parallelogram.

Page 184.—9. *a*, *ACB* and *BDE;* congruent because the 2 right triangles have one side and the two adjacent angles equal; *b*, *DE*; measure *DE*. **10.** 20′. **11.** 12′. **12.** 60°; 60°.

Page 185.—1. 30°. **4.** 1 in. **5.** 23.096 ft. **6.** 28.429 ft. **7.** 46.2 ft.

Page 186.—8. 50 ft. **9.** *b*, 45°; *c*, 60 ft.; *d*, 65 ft. **11.** 106.9 ft.

Page 187.—1. Second square's area is 4 times the first. **2.** Second square's area is $\frac{1}{4}$ of the first. **5.** 1 to 4. **6.** 1 to 2.

Page 188.—2. 6 in.; 60 ft.

Page 189.—3. 310 ft. **4.** About $8\frac{1}{2}$ in. **5.** About $4\frac{1}{2}$ in. **6.** About 171 rd.

Page 190.—1. $27\frac{5}{9}$ sq. ft. **2.** 48 sq. in. **3.** Bases: 14″, 14″, 4″, 11″. Altitudes: 10″, 6″, 7″, 6″. **4.** 70 sq. in.; 42 sq. in.; 14 sq. in.; 33 sq. in. **5.** 75 sq. in. **6.** Scalene: first and fourth; isosceles: second and fifth; equilateral: third and sixth.

Page 191.—8. 324 sq. rd. **9.** 52 sq. in. **10.** 4 sq. rd. **11.** 1 sq. mi. **12.** 8.4 sq. yd. **13.** $27\frac{1}{2}$ sq. in. **14.** .48 sq. mi. **15.** 60 sq. in. **16.** 11.2 sq. ft. **17.** $22\frac{1}{2}$ sq. yd. **18.** .72 sq. mi. **19.** $33\frac{3}{4}$ sq. in. **20.** 36 sq. in. **21.** .84 sq. ft. **22.** and **23.** Oral. **24.** The triangle is 390 sq. ft. larger. **25.** The rectangle measures 5″ x 2″. **26.** A right triangle with base $1\frac{1}{2}$″, altitude $1\frac{1}{4}$″.

Page 192.—1. 900 sq. ft.; 800 sq. ft.; $843\frac{3}{4}$ sq. ft.; $378\frac{1}{8}$ sq. ft.; $359\frac{3}{8}$ sq. ft.; 750 sq. ft.; 600 sq. ft.; 375 sq. ft. **2.** 256 sq. ft. **3.** The square is 4 sq. in. larger. **4.** 100 acres.

Page 198.—3. 45°. **4.** 40°; 36°.

Page 200.—1. A and C; B and D. **2.** A and B; C and D. **3.** They have equal angles; angles and sides correspond. **4.** $\frac{6}{3}$. **5.** $\frac{8}{4}$. **6.** $\frac{10}{8}$.

Page 201.—1. They are opposite equal angles; AC and DF, BC and EF. **2.** $\frac{1}{2}$; $\frac{1}{2}$; they are all equal. **3.** Yes. **4.** $\frac{8}{4} = \frac{6}{3}$. **5.** GI to $JL = \frac{2}{5}$; GK to $JK = \frac{3}{5}$; IH to $LK = \frac{4}{5}$. **6.** A is similar to C; B is similar to D.

Page 203.—2. 4. **3.** 3. **4.** 20. **5.** 50. **6.** 20. **7.** 35. **8.** 45. **9.** 7. **10.** $8.33\frac{1}{3}$. **11.** 162. **12.** 480. **13.** 165. **14.** 165 mi.

Page 204.—15. 800 lb. **16.** 8. **17.** 160 ft. **18.** $62\frac{1}{2}$ mi. **19.** $4.00. **20.** 720 bu. **21.** 2,560 bu. **22.** $500; $750.

Page 205.—23. $93\frac{3}{4}$ min. **24.** $54. **25.** 12. **26.** 12. **27.** 6. **28.** $2\frac{1}{2}$. **29.** 5 in. **30.** $7.20. **31.** 21 oz. **32.** $7\frac{1}{2}$ qt. **33.** 450 mi. **34.** 99 ft.

Page 206.—1. *a*, (1) $\frac{EH}{AD} = \frac{EF}{AB}$; (2) $\frac{AD}{EH} = \frac{AB}{EF}$; (3) $\frac{EH}{EF} = \frac{AD}{AB}$ *b*, (1). **3.** 10. **4.** $DE = 9$; $EF = 9$.

Page 207.—5. 80′. **6.** 2. **7.** 1. **8.** 10. **9.** 8. **10.** 21. **11.** 3. **12.** 21. **13.** $4\frac{1}{2}$. **14.** 12 in. **15.** $2\frac{1}{2}$ in.

Page 208.—16. $AB = 1$; $BC = 1\frac{1}{2}$; $AC = 2$. **17.** $AB = 2\frac{2}{3}$; $BC = 3\frac{1}{3}$; $AC = 4$. **18.** $AB = 4$; $AC = 3\frac{1}{2}$; $BC = 5$. **19.** The sides of the similar triangle will be 3 in., 6 in., and $7\frac{1}{2}$ in. **20.** 12 in., $15\frac{3}{7}$ in., $18\frac{6}{7}$ in. **21.** 2 in., $1\frac{1}{2}$ in., 1 in.; yes. **22.** Yes. **23.** 27 in.; 18 in.; $22\frac{1}{2}$ in.

Page 209.—2. 42 ft. **3.** $186\frac{2}{3}$ ft. **4.** 75 ft. **5.** 30 ft. **6.** 35 ft.

Page 210.—1. When their corresponding sides are proportional or when they are mutually equiangular. **2.** That the corresponding sides are not in the same ratio. **3.** Yes. **4.** *a*, 3; *b*, 8; *c*, 8; *d*, 14; *e*, 10; *f*, $5\frac{1}{3}$; *g*, $1\frac{1}{2}$; *h*, 4; *i*, 9. **5.** *a*, 3; *b*, 20. **6.** $\frac{4}{10} = \frac{2.80}{x}$. $x = 7$ hr. **7.** $\frac{AB}{DE} = \frac{AC}{DF} = \frac{BC}{EF} = \frac{2}{1}$. **9.** 100 ft. **10.** 200 ft.

Page 211.—Practice Test in Fractions V: **1.** $1\frac{1}{3}$. **2.** $5\frac{1}{4}$. **3.** $465\frac{1}{2}$. **4.** $10\frac{1}{2}$. **5.** $81\frac{1}{3}$. **6.** $29\frac{1}{9}$. **7.** $\frac{3}{4}$. **8.** 1. **9.** 5. **10.** $1\frac{7}{15}$. **11.** $2\frac{1}{5}$. **12.** $15\frac{37}{40}$. **13.** $75\frac{1}{4}$. **14.** $4\frac{11}{24}$. **15.** $3\frac{17}{24}$.

Practice Test in Decimals V: **1.** .13. **2.** 0. **3.** .08. **4.** 1.7. **5.** 1.70. **6.** 17.28. **7.** .47. **8.** .284. **9.** 39.48. **10.** 27. **11.** 21.005. **12.** 75.6. **13.** .624. **14.** 7.5. **15.** 762. **16.** 50.

Practice Test in Per Cent V: **1.** 4%. **2.** .25. **3.** 50%. **4.** 10%. **5.** \$10. **6.** 25%. **7.** 300. **8.** 150. **9.** \$2.50. **10.** 2%. **11.** 30.4. **12.** \$2.50. **13.** \$30. **14.** 112.5%. **15.** 100%. **16.** $121\frac{1}{3}$.

Page 212.—**1.** 6,215. **2.** 59,766. **3.** 50,184. **4.** 829. **5.** 14. **6.** $20\frac{2}{5}$. **7.** $1\frac{1}{8}$. **8.** $2\frac{3}{4}$. **9.** $\frac{18}{25}$. **10.** 89.12. **11.** 2,059.65. **12.** 7.4. **13.** 9.12. **14.** $16\frac{2}{3}$%. **15.** 1,200. **16.** .9375; 93.75%. **17.** 57.703. **18.** 12 ft. 9 in. **19.** 225%. **20.** $\frac{5}{6}$. **21.** 23. **22.** 2. **23.** $2\frac{2}{5}$. **24.** 8. **25.** 20.

Page 213.—**1.** $3''$; $\frac{13}{14}$; $4''$; $1\frac{5}{8}''$. **6.** (**1**), Three sides equal; (**2**), One side and 2 adjacent angles; (**3**), Two sides and included angle. **7.** 200 ft. **8.** *a*, 34; *b*, 11; *c*, $3\frac{1}{2}$; *d*, 16.

Page 214.—**1.** 40¢. **2.** \$4.25. **3.** \$5,878. **4.** 240 min. (4 hr.). **5.** \$10. **6.** $128\frac{1}{4}$ cu. ft. **7.** \$3 per hundred, or 3%. **8.** \$4.00. **9.** $\frac{38809}{39397}$. **10.** 132 sq. yd.

SECTION VII

Page 215.—**1.** 25; 36; 8; 100; 50,625; $\frac{1}{16}$; $\frac{27}{64}$; .25; 3.375. **2.** 16; 64; 9; 81. **3.** b^2; c^2; r^2; h^2; s^2.

Page 216.—**1.** 36 sq. in. **3.** 3; 4; 5; 6; 7; 8; 11. **4.** 8 ft.

Page 217.—**1.** 5 inches.

Page 218.—**4.** 15. **5.** 20. **6.** 25. **7.** 30. **9.** 20. **10.** 8. **11.** 12. **12.** 16. **13.** 3. **14.** 24. **15.** $h = 20$. **16.** $b = 20$. **17.** $h = 50$. **18.** $x = 12$. **19.** $b = 4$. **20.** $a = 6$. **21.** $a = 18$. **22.** $h = 40$.

Page 219.—**2.** 23.5. **3.** 21.5. **4.** 22.1. **5.** 22.8. **6.** 25.1. **7.** 49.5. **8.** 46.7. **9.** 47. **10.** 78.1. **11.** 79.85. **12.** 79.1. **13.** 80.9.

Page 221.—**1.** 32. **2.** 37. **3.** 48. **4.** 53. **5.** 62. **6.** 45. **7.** 67. **8.** 73. **9.** 49. **10.** 51. **11.** 61. **12.** 72.

Page 222.—**13.** 22.95. **14.** 27.12. **15.** 30.93. **16.** 28.87. **17.** 72.01. **18.** 66.95. **19.** 12.37. **20.** 27.50; 2.69.

Problems Involving Square Roots: **1.** 40 rd.; 160 rd. **2.** The perimeter of the rectangular field is 1 rd. larger.

Page 223.—**3.** 6 ft. **4.** 16.9 ft. **5.** 25.3 ft. **6.** 357.2 ft. **7.** 100 ft. **8.** 10 ft. **9.** 6.86 in.

Page 224.—**1.** $A = s^2$. **2.** 9 ft. **3.** 8 in. **5.** 5 in. **6.** 16 yd. **7.** 6 in. **8.** 5 in. **9.** s^3. **10.** 27 cu. in. **12.** 4 in.; 5 ft.; 6 yd.

Page 225.—**1.** Yes. **2.** No. **3.** *b* and *c*. **4.** 56.64 ft. **5.** 105 ft.; yes. **6.** Yes; $18\frac{1}{3}$%.

Page 227.—**1.** \$100. **2.** 72¢.

Page 228.—3. 20 da.

Page 229.—1. *a*, 13; *b*, 2″ x 8″ x 12′; *c*, 18; *d*, 1″ x 8″ x 16′; *e*, 4; two are 16′ long, two are 12′ long. **2.** *a*, 11′ 3″; *b*, 8′; *c*, 24; *d*, 12 on each side; *e*, 8′. **3.** *a*, 8′; *b*, 11′ 3″; *c*, 18, 8″ x 12′.

Page 230.—*d*, 7, no, 12-ft. length; *e*, 8′ x 18′, from side and rear elevations.

The Masonry Work: **1.** $83.40, making no allowance for corners; $75.20, with allowance for corners. **2.** $442.80; $.60 a cu. ft. (no allowance for corners).

Page 231.—3. $590.40. **4.** $405.56. **5.** 21.414 M.

Carpeting: **1.** Same amount either way: $28\frac{4}{9}$ yd.

Page 232.—2. $30.40. **4.** $21.33. **5.** $9\frac{1}{3}$ sq. yd.

Painting: **1.** $6.20. **2.** Approx. 2 half days, allowing time for paint to dry.

Page 233.—1. 5,368. **2.** $1\frac{3}{4}$. **3.** 476,775. **4.** 88.90+. **5.** 25. **6.** $18\frac{5}{8}$. **7.** 52. **8.** 6. **9.** 393.984. **10.** 200.83. **11.** 104.3. **12.** $5\frac{1}{4}$. **13.** $1.25. **14.** $59.88. **15.** 300. **16.** 93.75%. **17.** 21. **18.** 3. **19.** 30%. **21.** 45. **22.** 991.75. **23.** 977.7855. **24.** 30.78. **25.** 4.

Page 234.—1. $1\frac{17}{20}$. **2.** $8\frac{7}{8}$. **3.** $31\frac{1}{2}$. **4.** $20\frac{1}{4}$. **5.** 75. **6.** $1\frac{1}{3}$. **7.** $\frac{4}{5}$. **8.** $13\frac{9}{20}$. **9.** $\frac{1}{8}$. **10.** $3\frac{7}{12}$. **11.** 4. **12.** $3\frac{23}{24}$. **13.** $1\frac{1}{18}$. **14.** $9\frac{3}{4}$. **15.** $\frac{4}{5}$.

Practice Test in Decimals VI: **1.** 6.3. **2.** .07. **3.** 10.269. **4.** .03. **5.** .05. **6.** 9.31. **7.** 5. **8.** 3.735. **9.** .732. **10.** 31.85. **11.** 2.552. **12.** 30.084. **13.** 16.38. **14.** .052. **15.** 110. **16.** 7,640.

Practice Test in Per Cent VI: **1.** $37\frac{1}{2}$%. **2.** 60%. **3.** .005. **4.** $16\frac{2}{3}$%. **5.** $2.16. **6.** $16\frac{2}{3}$%. **7.** $18.75. **8.** 480. **9.** 120%. **10.** $14.40. **11.** 24.752. **12.** 1%. **13.** $15.60. **14.** 75. **15.** $62\frac{1}{2}$%. **16.** $.29.

Page 235.—1. $22.50; $34.50; $37.50; $40; $48.75; $55; $75. **2.** $253.75; $297.50; $276.50; total, $827.75. **3.** $16\frac{1}{4}$%. **4.** Rug, $5 less.

Page 236.—5. 25%. **6.** 50%. **7.** $2,045.49. **8.** $2,000. **9.** $680,000. **10.** $306.

Page 237-238.—1. 40; 5 ft. **2.** 60. **3.** $4\frac{1}{6}$ ft. **4.** $\frac{1}{3}$ ft. **5.** $5\frac{1}{8}$ ft. **6.** 3. **7.** 10 rd.

Page 240.—1. 3.98; 3.9. **2.** The meter. **4.** $\frac{1}{10}$ meter. **5.** $\frac{1}{10}$; $\frac{1}{100}$. **7.** .45 meters. **8.** .05; .005. **9.** Line **1**, 2; line **2**, 2.4; line **3**, 1.6; line **4**, 3.8; line **5**, 4; line **6**, 2.6; line **7**, .3; line **8**, 1.5; line **9**, .2; line **10**, .1. **10.** 18.3 sec. **11.** 31 miles.

Page 242.—6. *a*, 40 sq. in.; *b*, 12 sq. ft.; *c*, 36 sq. ft.; *d*, $28\frac{2}{7}$ sq. ft. **7.** 756 sq. ft. **8.** 44 in. **9.** 70 cu. ft.; $252\frac{1}{2}$ cu. in.; 60 cu. ft. **10.** 12 in. **11.** $1\frac{1}{2}$″ x $1\frac{1}{4}$″.

Page 243-244.—1. $10\frac{1}{2}$ ft. **2.** $408\frac{4}{7}$ sq. ft. **3.** 62,857 in. per min. **4.** 288; 86,400. **5.** 154 sq. ft. **6.** $117\frac{5}{9}$ ft. **7.** $593\frac{1}{7}$ sq. ft. **8.** 11.79+ sq. in. **9.** .1625 ft. **10.** *a*, 154 sq. in.; *b*, 15,400 lb. **11.** Square is $2\frac{2}{7}$ sq. ft. larger in area. **12.** 720. **13.** *b*, 15 ft.; *c*, $50\frac{4}{7}$ sq. ft.; *d*, $126\frac{1}{2}$ sq. ft.; *e*, $54\frac{71}{126}$ sq. ft. each—total, $109\frac{8}{63}$ sq. ft.; *f*, $57\frac{2}{3}$ ft.; 23 ft.; *g*, $1,326\frac{1}{3}$ sq. ft.; *h*, $50\frac{2}{7}$ sq. ft. in all; *i*, $84.05.

Page 245.—Word answers orally. Formulas: **1.** $A = \frac{ab}{2}$. **2.** $A = ab$. **3.** $A = lw$. **4.** $P = a + b + c$; $P = 2a + 2b$; $P = 4s$. **6.** $A = \left(\frac{D}{2}\right)^2\pi$; $C = d\pi$ or $2\pi r$. **7.** $A = a\left(\frac{b + b'}{2}\right)$. **8.** $s = \frac{d}{t}$. **9.** $t = \frac{d}{r}$.

Page 246.—**1.** Rectangles: ***a***, 56 sq. in.; ***b***, $26\frac{1}{4}$ sq. ft.; ***c***, 93 sq. rd.; ***d***, 12 in. **2.** Triangles: ***a***, 6 sq. in.; ***b***, $2\frac{1}{4}$ sq. ft.; ***c***, 23.7 sq. yd.; ***d***, 10 in. **3.** Parallelograms: ***a***, 2,250 sq. ft.; ***b***, $4\frac{3}{8}$ sq. in.; ***c***, 136.5 sq. ft.; ***d***, 25.479 sq. yd. **4.** Circles: ***a***, $9\frac{3}{7}$ in.; $7\frac{1}{14}$ sq. in.; ***b***, 22 in.; $38\frac{1}{2}$ sq. in.; ***c***, 66 ft.; $346\frac{1}{2}$ sq. ft.; ***d***, 19.8 in.; 31.185 sq. in. **5.** Rectangular solids: ***a***, 84 cu. in.; ***b***, $4\frac{3}{8}$ cu. ft.; ***c***, 10 ft.; ***d***, 2.5 in.; ***e***, $2\frac{2}{3}$ ft. **6.** ***a***, 30 in.; ***b***, 22 ft.; ***c***, 39.8 rd.; ***d***, 44 in. **7.** 10.125 sq. in.

Page 247.—**1.** Oral. **2.** By adding the separate expenses.

Page 248.—**3.** By subtracting total expenses from the gross profit. **4.** Rent, \$.013; salaries and wages, \$.106; advertising, \$.0035; boxes, \$.006; delivery, \$.012; office supplies, \$.0015; heat, etc., \$.003; taxes and licenses, \$.002; insurance, \$.0015; repairs, \$.001; depreciation, \$.003; interest, \$.01; miscellaneous expenses, \$.007; losses from bad debts, \$.0035. **5.** 7%. **6.** 80.9%. **7.** \$1,800. **8.** \$320,000. **9.** \$10,600; \$350; \$600; \$1,200; \$150; \$1,300; \$300; \$200; \$150; \$100; \$300; \$1,000; \$700; \$350.

Page 249.—**1.** \$3; $37\frac{1}{2}$%.

Page 250.—**2.** $33\frac{1}{3}$%. **3.** $33\frac{1}{3}$%. **4.** 40%. **5.** $45\frac{5}{9}$%. **6.** \$8.25; \$8.80; \$9.90; \$11; \$13.20. **7.** \$7.13; \$7.60; \$8.55; \$9.50; \$11.40. **8.** No, he has overhead expenses.

Finding missing numbers: **9.** \$2.50; $33\frac{1}{3}$%. **10.** \$5.50; $45\frac{5}{11}$%. **11.** \$8; 20%. **12.** \$8; $16\frac{2}{3}$%. **13.** \$3.50; $21\frac{7}{8}$%. **14.** \$18; \$20. **15.** \$20; \$25. **16.** \$1.35; \$.15. **17.** \$940; 6%. **18.** \$2.50; $12\frac{1}{2}$%. **19.** \$608; \$32.

Page 251.—Oral.

Page 252.—**1-15.** Oral.

Test: **1.** 3,783. **2.** 18,839. **3.** 532,996. **4.** 950. **5.** $25\frac{11}{24}$. **6.** $7\frac{9}{10}$. **7.** $256\frac{1}{2}$. **8.** 2. **9.** 27.25. **10.** 33.75. **11.** 36.9. **12.** 30.2. **13.** .583. **14.** $\frac{1}{20}$; .05. **15.** \$300. **16.** 125%. **17.** 500. **18.** 18. **20.** $12\frac{4}{7}$ sq. in.; $12\frac{4}{7}$ in. **21.** 4. **22.** 12. **23.** 9. **24.** 3. **25.** 5.

Page 253.—**1.** 8. **2.** 17 mi. **3.** 160 rd. **4.** \$60. **5.** $43\frac{1}{5}$ mi. **6.** $33\frac{1}{3}$%. **7.** 44.8 T. **8.** \$263.50. **9.** \$11.94. **10.** \$78.75.

Page 254.—Set I: **1.** 4 hr. **2.** $25\frac{3}{5}$ T. **3.** 38.4 bu.; \$57.60. **4.** \$160. **6.** \$25.60. **7.** 1,944 sq. ft. **8.** \$7.70.

Page 255.—**9.** \$60.

Set II: **1.** \$13.20. **2.** \$303. **3.** \$35.37. **4.** \$3,924.30. **5.** \$1,522.50. **6.** 26 da.; \$1,405.48. **7.** $28\frac{2}{7}$ in. **8.** \$660. **9.** \$72.50.

Page 256.—Set III: **1.** \$153. **2.** \$6.75. **3.** \$.12. **4.** Renting, \$5. **5.** \$166.32. **6.** \$3.50; \$5; \$7.50. **7.** $40\frac{10}{11}$ mi. **8.** \$13.33. **9.** \$1,002,000; \$48.

DATE DUE SLIP

F. 255

QA 39 B21 BK-2 MAN-
BANTING LILIAN
MATHEMATICS FOR EVERYDAY USE

NL 39408117 CURR HIST

000028566362